

STUDIES IN THE XYLARIACEAE: VIII. XYLARIA AND ITS ALLIES

P. Martin

(Department of Microbiology, South African Institute for Medical Research)

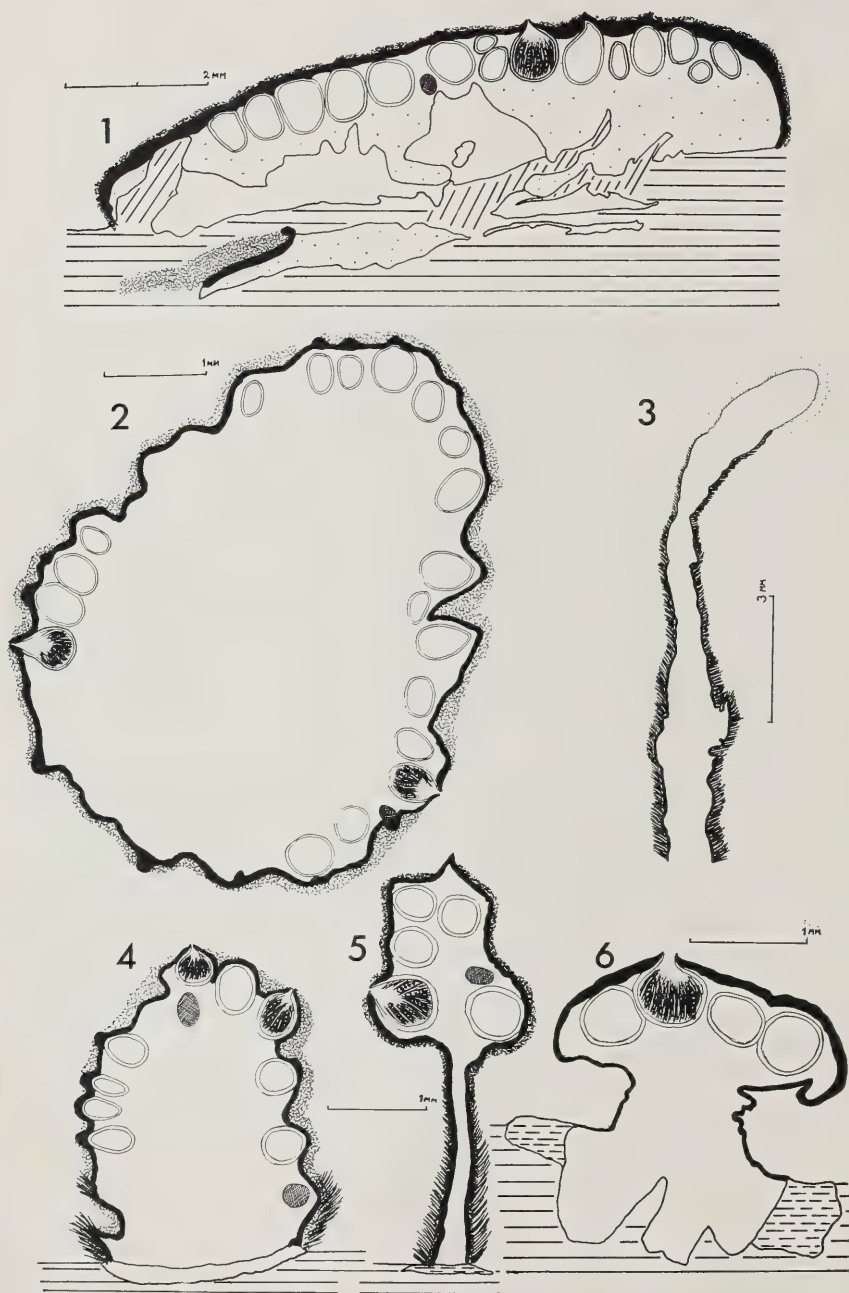
The so-called “fleshy” genera of the Xylariaceae, characterized by a white interior, are actually the most poorly defined of the family, yet they include some of its oldest known representatives. In structure they are uniform and fairly specialized, but the extreme range in morphology has led to considerable confusion of specific limits and interrelationships.

The most important and hitherto little emphasized taxonomic character is probably the development of the ectostroma. This is present in the majority of species as a continuous or scabrous, smooth or verrucose crust of dark anastomosing mycelium, soft in texture and varying from white or yellow to dark brown at maturity. Varitchak (1931) and Brown (1913) in their studies of stromal development make only passing reference to it. Saccardo referred to a shaggy (*hordellus*) outer layer in many of his descriptions of *Xylaria* throughout the Sylloge Fungorum but did not comment further. Miller (1942, p. 262) referred to a “pellicle” or crust visible as plaques or linear strips, but apparently did not compare it directly with any structure in *Hypoxylon*. The development of the ectostroma, which is corky in nature, runs concurrently with that of conidia at the distal end of the stroma and/or a subiculum of dark felty hyphae at the base.

The number of species in which the ectostroma truly cannot be recognized is small and the degree of affinity between them not well known. In some of these species, also, the outer crust formed from the entostroma remains soft instead of becoming rigid and “carbonaceous”. The entostroma is, however, characteristically divided into rigid outer crust enclosing the perithecial apices and a soft or fleshy interior beneath the perithecia. No separation occurs between the two. The centre tissue is usually pure white but may be cream, dull yellow or even grey, and it varies in like manner from solid to hollow or involute.

The ascus plugs are cubic to rectangular and usually very prominent on staining with iodine. The only other groups to have this character are *Hypoxylon* sect. *Entoleuca* and *Anthostomella*. (See Plate III:1).

The classical disposition of the genera is as follows:



Kretzschmaria Fries E. M. Summa Vegetabilium Scandinaviae 409, (1849).

Unfortunately there is no easy distinction between the less specialized members of the genus and the "carbonaceous" series of *Hypoxyton* and *Rosellinia* described previously under the section Entoleuca. Attempts to define these intermediates have resulted in the establishment of at least 4 genera, *Kretzschmaria* Fries (1849), *Sarcoxyton* Cooke (1883), *Penzigia* Saccardo (1888, 1892), and *Ustulina* Tulasne (1863).

If a major taxon should be constituted to embrace one or more unique trends of specialization, then the writer believes that *Kretzschmaria* alone deserves retention. If, on the other hand, it is admissible to regard a genus as a "catch-all" for species of vague affinity, then one might view all these genera as acceptable. *Kretzschmaria* is distinct from *Xylaria* chiefly in that all the perithecia are vertically oriented, and in addition many accepted species of *Kretzschmaria* are characterized by the excentric development of the growing axis which becomes an umbonate or aristate sterile apex on one side of the fertile clava. The type species, *K. clavus* Fr., does not show this peculiarity, but is otherwise clearly related on account of the flattened obconic nature of the clava.

Ustulina Tulasne L. & P. Selecta Fung. Carpol. 2, 23, (1863).

This genus was based on *U. vulgaris* (*Hypoxyton ustulatum* Bulliard), taking into consideration the extensive superficial aplanate form of the stroma and the fleshy nature of the entostroma. The writer agrees with Miller (1961 p. 2) that the genus lacks clear definition, but feels that the species have greater affinity to the Xylariaceous series of genera and to *Kretzschmaria* in particular, rather than to *Hypoxyton* section Entoleuca where they were placed by Miller.

Other species of *Kretzschmaria* are subglobose in form though still stipitate, and these can hardly be separated from those in *Penzigia* which at present includes species of considerable range of form: some with a definite stipe, others sessile and attached at a narrow point only, and others with clavata varying

FIGURE I. Stromal Structure, diagrammatic

Vertical lines and dots: Conidiophores and conidia
 Irregular lines: Dark crustose mycelium (ectostroma)
 Straight lines: Setose or subiculate hyphae
 Solid black: Carbonaceous entostroma
 White, black or dotted: Fleshy entostroma
 Horizontal lines: Wood
 Interrupted lines: Fungal invasion of wood

All are vertical sections except (2); Horizontal

1. *Xylaria berteri*: Penzigoid stroma
2. *Xylaria leprosa*: Typical *Xylaria* stroma
3. *Xylaria fioriana*: Coremium
4. *Xylaria fioriana*: Penzigoid stroma
5. *Xylaria apiculata*: Stroma clearly differentiated into stipe and clava
6. *Podosordaria plumosa*: Stroma without apparent ectostroma

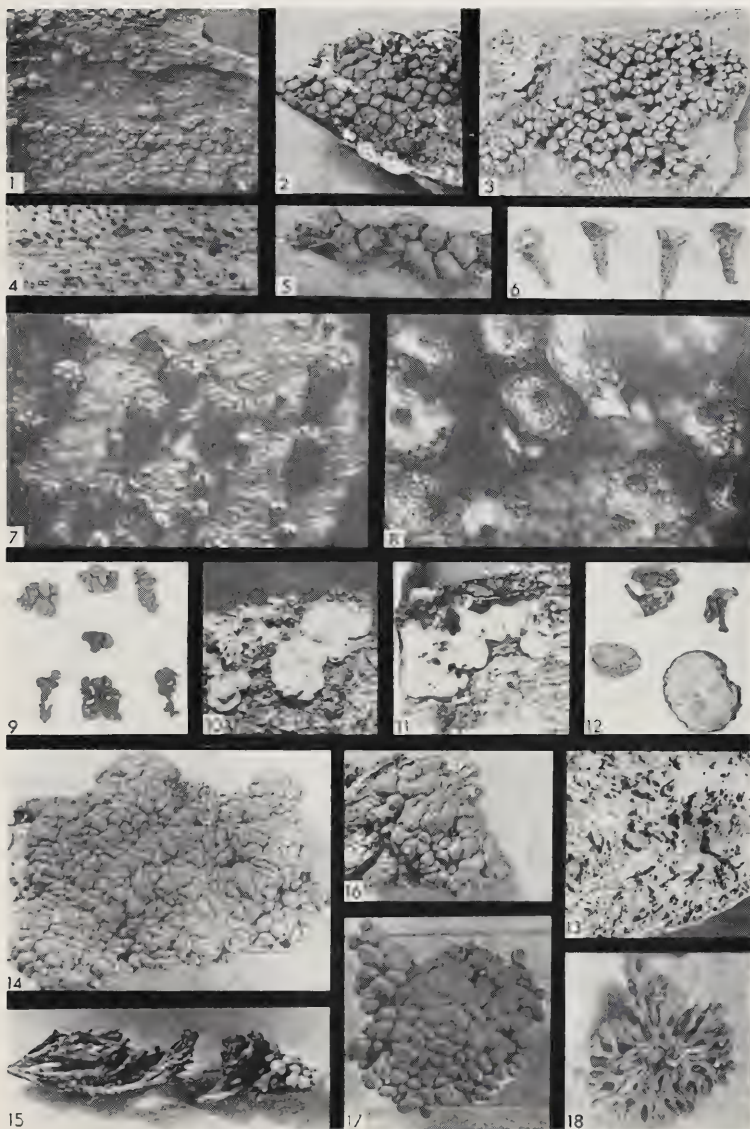
from pulvinate to cylindric. *Penzigia*, though likely established by Saccardo to accommodate such awkward species, was not given precise definition. The generic description runs: "...stroma subgloboseum vel hemisphaericum vel obpyriforme, intus plerumque radiatofibrosus (numquam concentricè zonatus) extus crustaceolaccatus (pallens), lebe; perithecia stromate omnino immersa, collis brevibus vel subnullis; ostiola punctiformia non extantia...". The precise definition of *Penzigia* has always been in doubt, notwithstanding Petch's attempts (1924, p. 138). Miller assigned several species to it in which there is a clear white basal tissue, but did not apparently give consideration to many others in the section *Entoleuca* of *Hypoxylon* described earlier where the situation is identical, or where the entostroma is not heavily discoloured.

Sarcoxylon Cooke, based originally on the single species *S. compunctum* (Jungh) Cooke, could not be distinguished from *Penzigia*. However, Cooke and others confused the issue by adding further species to *Sarcoxylon* that properly belonged to *Entonaema*. Of these, *S. aurantiaca* Pat. is synonymous with *E. liquescens* Möller, while the other four, *S. spathulatum* (B. & Br.) Petch, *S. lycogaloides* (B. & Br.) Cke., *S. deightoni* Petrak, and *S. lerati* (Henn.) Lloyd are still not sufficiently known, and the writer has not examined any specimens. The type species *S. compunctum*, is now *Xylaria compuncta* (Jungh) Berk., where it is correctly placed.

The writer proposes to combine part of *Penzigia* with *Kretzschmaria* and part with *Xylaria*, based primarily on the orientation of the perithecia. All stipitate or sessile species of *Penzigia* in which the clavata or clavulae vary

PLATE I. Stromata

1. *Kretzschmaria frustulosa* $\times$ (0·6)
2. *Kretzschmaria heliscus* $\times$ (0·6)
3. *Kretzschmaria novo-guineensis* $\times$ (0·6)
4. *Kretzschmaria (Stilbohypoxyton) rehmi* $\times$ (0·6)
5. *Kretzschmaria aggregata* $\times$ (1·6)
6. *Kretzschmaria tuckeri* $\times$ (1·6)
7. *Kretzschmaria rehmi*: Excentric sterile apices and uniperitheciate stromata $\times$ (6)
8. *Kretzschmaria novoguineensis*: Excentric apices and multiperitheciate stromata $\times$ (6)
9. *Kretzschmaria verrucosa* $\times$ (0·4)
- 10—13. *Kretzschmaria deusta* $\times$ (0·4)
 10. Early conidial stage
 11. Later stage with developing perithecia
 12. Mature stage: Views of superficial stromal crust and part of branching system beneath substrate
 13. Part of the branching system on wood after bark has been removed
14. *Kretzschmaria lichenoides* $\times$ (0·6)
15. *Kretzschmaria cetrarioides* $\times$ (0·6)
16. *Kretzschmaria coenopus* $\times$ (0·6)
- 17—18. *Kretzschmaria xylarioides*: Surface and reverse views of stromata to show branching habit $\times$ (0·6)



from pulvinate to obconic instead of globose or cylindrical, the perithecia are vertically oriented instead of horizontally, and the sterile apices of stromata if present are excentric, are placed in *Kretzschmaria*. The basal tissue in these species is soft and corky, rarely rigid (i.e. resistant to the point of a needle) and pure white or discoloured brown. Those species of *Penzigia* in which the stroma is white and rigid and many of the perithecia are lateral as well as vertical, (including the type species *P. compuncta* (Jungh) Sacc. & Paol., *Penzigia cretacea* (B. & Br.) Sacc. & Paol. and *P. dealbata* (Berk & Curt.) Sacc. & Paol., and others, *P. berteri* (Mont.) Mill. and *P. enteroleuca* (Speg.) Miller), are disposed here under *Xylaria*, ignoring the broad differences in stromal shape.

The subsessile species, *P. discolor* (B. & Br.) Miller, *P. bermudensis* Miller, *P. citrina* (Shear) Miller and their relatives were placed in *Hypoxylon* section Entoleuca (Martin 1967) because of general similarity, including the ability to form uniperitheciate stromata with the perithecia evident in outline. They are obviously transitional between *Hypoxylon* and *Kretzschmaria*.

One additional subsessile species, *Hypoxylon cyclopicum* Spegazzini, formerly placed in Miller's section Primocinerea of *Hypoxylon*, is considered to be a true *Kretzschmaria*.

Finally, there is the small genus *Stilbohypoxyton* Hennings (1902). The type, *S. mölleri* Henn. is based on an immature specimen, but both this species and *S. rehmi* Theissen (1908) with which it is probably synonymous, are distinguished by the excentric position of the growing apices with respect to the fertile portion. This relates the species to the *Kretzschmaria* series, while the coremioid nature of the apex, which may also bear conidia, is typical of *Xylaria* as well. The small number of perithecia (1—2) and their sharp outline, however, is characteristic of *Hypoxylon*. The writer prefers to place this taxon as a section of *Kretzschmaria*.

KEY TO THE SPECIES

- 1 Stromata uni—or biperitheciate, with ovoid or pulvinate fertile portion bearing a distinct excentric ochraceous umbo that may bear conidia when young; ectostroma in plaques, yellowish-green; entostroma divided into outer black crust and inner white corky basal portion; perithecia evident in outline; spores gibbous to navicular, narrow ended, medium brown, $6.5 \times 15.5 \mu$
 Section *Stilbohypoxyton* Hennings
 Kretzschmaria rehmi (Theissen) Martin (Plate I:4, 6)
 syn. *Stilbohypoxyton rehmi* Theissen
 ? syn. *Stilbohypoxyton moelleri* Hennings
- 1' Stromata simple or branched, clavate or clavulae with few or several perithecia but always immersed and not clearly evident in outline; growing apices when visible at maturity always excentric; ectostroma continuous or in plaques; entostroma divided into outer black crust and inner white or discoloured corky basal portion
 section *Eukretzschmaria* Martin 2
- 2 Stromata with distinct stipes above substrate or with excentric sterile apices; clavata not aplanate 8

- 2' Stromata attached at a central point only, or rarely by a broad base; apex fertile if developed; clavata sometimes aplanate with ramifying stroma beneath substrate.....3
- 3 Spores with spiral germ slits, navicular, narrow-ended, medium brown, $11\cdot0\times32\cdot5\mu$; stromata pulvinate; ectostroma in plaques, dull brown
Kretzschmaria atosphaerica (Masse) Martin
syn. *Penzigia atosphaerica* (Masse) Miller
- 3' Germ slits straight or rarely undulating.....4
- 4 Stromata pulvinate, not more than 10 mms. diam.....5
- 4' Stromata aplanopulvinate or aplanate, or globose-cylindric, of large size.....6
- 5 Spores equilateral, oval, broad ended, amber, $2\cdot5\times5\cdot0\mu$
Kretzschmaria frustulosa (B. & C.) Martin (Plate I:1)
syn. *Penzigia frustulosa* (B. & C.) Miller
- 5' Spores gibbous, narrow-ended, dark brown, $13\cdot0\times28\cdot0\mu$
Kretzschmaria arntzenii (Theiss.) Montagne
syn. *Penzigia arntzenii* (Theissen)
- 5' ' Spores crescentic, narrow-ended, dark brown, $6\cdot0\times17\cdot0\mu$; germ slits linear
Kretzschmaria turbinata (E. & E.) Martin
syn. *Poronia turbinata* Ellis & Everhart
- 6 Stromata predominantly pulvinate, or globose-cylindric, with verrucous surface; ectostroma in clear dark brown plaques; spores gibbous, with narrow or beaked ends, dark brown, $10\cdot0\times40\cdot0\mu$
Kretzschmaria verrucosa (Mill.) Martin (Plate I:9)
- 6' Stromata predominantly aplanate, ectostroma continuous.....7
- 7 Saprophytic; stroma aplanate to aplanopulvinate, sessile and attached evenly or by a central point, or stipitate; stroma fairly extensive, variable but usually at least 10 mm diam.; ostioles medium papillate; spores navicular to crescentic, with acute or rounded ends, dark brown to black, $7\cdot5-9\cdot0\times30\cdot5-37\cdot5\mu$
Kretzschmaria deusta (Hoffm. ex Fr.) Martin
Ustulina deusta Hoffm. ex Petrak
- 7' Saprophytic; stroma aplanate but less variable than above; ostioles prominent papillate; spores navicular, dark brown, $12\cdot0\times40\cdot5\mu$
- 7' ' Parasitic on numerous tropical crops, rubber, tea, etc.; stromata aplanate or resupinate with marked zonate growth, or multiclavulate and coalescent; ostioles not prominent; spores crescentic, with rounded ends, dark brown to black, $8-13\times30-48\mu$
Kretzschmaria zonata (Lév) Martin
syn. *Ustulina zonata* Lévillé
- 8 (2) Clavata or clavulae with distinct sterile excentric apices.....21
- 8' Clavata or clavulae terminating growth.....9
- 9 Stipes with irregularly uneven surface.....10
- 9' Stipes smooth.....11
- 10 Ostioles papillate but not prominent; subiculum present on lower part of stipe; spores absent in type material (NYBG)
Kretzschmaria tuckeri Ined.? (Plate I:6)
- 10' Ostioles prominent papillate; subiculum absent; spores gibbous, broad ended, dark brown, $5\cdot0\times5\cdot5\times9\cdot0-10\cdot5\mu$
Kretzschmaria microspora Hennings
- 11 (9) Spores not exceeding 14μ in length; stromata less than 4 mm high.....12
- 11' Spores longer than 14μ , average spore lengths over 20μ ; stromata larger.....13
- 12 Spores $4\cdot5-6\cdot5\times10\cdot0-12\cdot5\mu$, gibbous, narrow-ended, dark brown, without visible sheaths
Kretzschmaria heliscus (Mont.) Masse
syn. *Kretzschmaria sessilis* Patouillard
- 12' Spores $5\cdot0\times11\cdot5\mu$, gibbous to navicular, narrow-ended, pale brown, with prominent sheaths
Kretzschmaria chardoniana (Mill.) Martin
syn. *Penzigia chardoniana* Miller
- 13 (11) Spores with spiral germ slits.....14
- 13' Spores with straight germ slits.....15

- 14 Outer layer yellow ochre; stromata unbranched or producing up to 3 clavulae; spores crescentic, narrow-ended, dark brown, $11.0 \times 38.0 \mu$
Kretzschmaria pechuelii Hennings
- 14' Outer layer dull brown; stromata producing up to 5 clavulae; spores crescentic, gibbous or navicular, with narrow ends, dark brown, $14.5 \times 46.0 \mu$
Kretzschmaria spinifera Ellis & Everhart
- 15 (13) Ostioles prominent papillate 16
- 15' Ostioles not prominent 17
- 16 Stromata up to 5 mm high with 2–10 clavulae per stroma; spores crescentic, broad-ended, medium to dark brown, $8.5 \times 32.5 \mu$
Kretzschmaria micropus Fries
- 16' Stromata larger, up to 20 mm high, with 1–16 clavulae per stroma; spores gibbous to navicular, narrow-ended, dark brown, $10.0 \times 40.0 \mu$
Kretzschmaria verrucosa (Mill) Martin
 syn. *Penzigia verrucosa* Miller
- 17 Subiculum present on lower parts of the stipes; upper surface of clavulae convex; spores navicular, narrow-ended, dark brown, $8.0-9.0 \times 33.5-34.0 \mu$
Kretzschmaria coenopus (Fr.) Saccardo (Plate I:16)
- 17' Subiculum absent 18
- 18 Stromata unbranched, or producing less than 16 clavulae 19
- 18' Stromata indefinitely ramose, clavulae more than 16 and up to 200, close together; ostioles not prominent; spores navicular to crescentic, narrow-ended, medium brown, $8.5-9.0 \times 27.0-36.0 \mu$
Kretzschmaria lichenoides Ricker (Plate I:14)
- 19 Upper surface of clavulae convex, ostioles minutely papillate; stromata usually of small size, less than 5 mm high; spores navicular to crescentic, narrow-ended, medium brown, $8.0 \times 30.0 \mu$
Kretzschmaria pusilla Ellis & Everhart
- 19' Upper surface of clavulae usually flat, ostioles medium papillate; stromata above 5 mm high 19
- 20 Spores gibbous to navicular, narrow-ended, medium to dark brown, $8.5-9.5 \times 26.0-27.5 \mu$
Kretzschmaria clavus Fries
- 20' Spores crescentic, narrow-ended, medium to deep brown, $7.0-7.5 \times 28.0-32.0 \mu$
Kretzschmaria puiggarii (Speg.) Saccardo
 (This is possibly only a variety of *K. clavus*)
- 21 (10) Stromata unbranched or producing less than 16 clavulae 29
- 21' Stromata branched indefinitely; 50–100 clavulae per stroma 24
- 22 Ostioles prominent, beak or spout shaped 23
- 22' Ostioles papillate but not prominent, ectostroma grey, continuous; spores gibbous, broad or narrow ended, medium brown, $12.0 \times 26.5 \mu$
Kretzschmaria proxima Patouillard
- 23 Clavulae sessile and close together; ectostroma dull brown at maturity, in polygonal crusts; spores gibbous to crescentic, narrow-ended, dark brown, $8.5-10.5 \times 31.5-34.5 \mu$
Kretzschmaria aggregata (Welw. & Currey) Saccardo (Plate I:5)
 syn. *Hypoxyton cyclopicum* Spegazzini
- 23' Clavulae short stipitate, close dispersed; ectostroma fawn brown at maturity, in polygonal crusts; spores navicular, narrow-ended, dark brown, $12.0 \times 41.0 \mu$
Kretzschmaria novoguineensis Hennings (Plate I:3, 8)
- 24 (21) Branching of the stromata arborescent or ascending; ostioles prominent; spores gibbous to navicular, narrow-ended, dark brown, $8.0 \times 28.5 \mu$
Kretzschmaria cetrarioides (Welw. & Currey) Saccardo (Plate I:15)
- 24' Branching of the stromata radiate, from central point; ostioles papillate but not prominent; spores gibbous to navicular, narrow-ended, dark brown, $8.5 \times 26.5 \mu$
Kretzschmaria xylarioides Spegazzini (Plate I:17, 18)

1. *Kretzschmaria deusta* (Hoffm. ex Fr.) Martin nov. comb. (Plate I:10-13)

sub *Hypoxyton deustum* (Hoffm. ex Fr.) Greville

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 sub *Sphaeria undulata* Hooker W. J. Flora Scotica II, 5, (1821).
 sub *Sphaeria versipellis* Tode Fung. Meckl. 2, 55, (1791).
 sub *Ustulina deusta* Hoffm. ex Petrak
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The stromata are divided into a flat or convex fertile portion and a sterile base of varying extent. Periodic collections made from old logs of *Olea capensis* in the Garden of Eden, Knysna, show that the morphology of the fungus varies according to the nature of the host substrate. On hard wood and bark not greatly decayed, the fertile stroma is aplanate, irregularly effused and crustose, $11\text{--}20 \times 12\text{--}36 \times 1.8\text{--}3.0$ mm and the sterile base is very short or practically undeveloped. The stroma is close in general structure to that of *Hypoxylon entoleucum*, except for the deeper immersion and greater degree of coalescence of the perithecia and general attachment only at the mid-point of the stroma to the wood. On decorticated soft wood, the attachment may be greatly extended into a distinct stipe $2.5\text{--}4.0 \times 10\text{--}15$ mm, extending into the substrate. On

bark, where the wood is greatly decayed beneath, the fertile stroma itself varies in form from the flat aplanate type to small pulvinate or conic, and this similarity to typical species of *Kretzschmaria* is strengthened by indefinite ramification of the stroma beneath the bark and production of several fertile heads by the same branching system. The latter tends to be a perennial occurrence.

The ectostroma is at first white, bearing greenish grey conidia over the surface except for a sterile marginal zone up to 5 mm wide; later it becomes pale grey brown and finally dark grey to black, continuous, with age becoming cracked concentrically or scabrous, either sloughing off or merging with the carbonous entostroma. Entostroma white, fleshy, of variable extent, becoming carbonous above the perithecia and corky beneath; the latter tissue disintegrating after maturity. Perithecia large, globose, $1200-1400 \times 1000-1200\mu$; ostioles distinct papillate. Asci cylindric or clavate, usually long stalked, $170-330 \times 11-14\mu$; stipes $60-170\mu$. Spores elliptic, navicular to crescentic, with pointed or rounded ends and prominent gelatinous sheaths, dark brown to almost black, $6.0-12.0 \times 2.3-3.0-36.5\mu$, ave. $8.4 \times 30.9\mu$.

South African hosts: *Olea capensis*, *Ocotea bullata*

Material examined:

A large quantity of material in the herbaria cited. Martin 50—52, 377, 463, 1050; Garden of Eden, Knysna, Western Cape, South Africa (1958, 1959) Martin 552; Hogsback, Alice, E. Cape, South Africa, (1959). Martin 1958; Stoneybrook, Rockland Co., NY State, U.S.A., (1963). Martin 1697; Mt. Toby State Forest, Mass, U.S.A., (1963). Martin 1815 ex Carroll 124; Faksingeskor, Denmark, (1962).

Cultural characters (Plate IV:1, Plate V:3):

Colonies velvet-fleecy, pure white, opaque with fine texture, uniform. Margin distinct, 7—15 mm wide, sometimes with characteristic plumose fronds, otherwise canescent, segmented or lobed, compact. Carbonization of the medium takes place between 10 & 20 days and is extensive. Growth rate moderate, 2.6 mm/day at 25°C. Growth on other media similar; Czapek cultures extremely furrowed and distorted. No coremia have been observed in culture.

Microscopic characters (Fig. II:2, 5):

Primary mycelium undiagnostic, maximum diameter of marginal hyphae $=2.3\mu$. Secondary mycelium peculiar, consisting of wide plate-like masses of large cells $3.0-16 \times 10-18\mu$ which are carbonized and dark in colour. They arise by indefinite branching and anastomosis of very short hyphae.

Imperfect stage: (Fig. II:3—4; Plate I:10).

Brooks F. T. (1953), Lindau G. (1897), loc. cit. Wilkins W. H. Trans. Brit. Mycol. Soc. 23, 65—85, (1939).

Conidiophores and conidia have never been observed in culture, whether on agar or wood. On young stromata they are formed in a palisade 82—100 μ high,

closely compacted. Each consists of a lateral indefinitely branched system, $2.2-2.5\mu$ in diameter, producing erect fertile hyphae, which in turn sometimes bear short side branches also giving rise to conidia. The fertile branches are smooth or partly serrate, $10-19 \times 1.9-2.5\mu$. Conidia are pleuracrogenous, elliptic to oval, very pale grey collectively, $2.0-2.9 \times 4.6-7.7\mu$, ave. $2.4 \times 6.0\mu$.

Kretzschmaria deusta is a species defying generic boundaries, but may be regarded as an intermediate between *Hypoxylon* and the *xylariaceous* genera. It is important to note that no difference in cultural characters was evident among cultures taken from stromata of widely different form.

2. *Kretzschmaria heliscus* (Mont.) Massee (Plate I:2)

Dennis R. W. G. Kew Bull. 1957, 313, (1957). Lloyd C. G. Myc. Writ. 5: Large Pyrenomycetes II, 22, (1919). Massee G. Kew Bull. 1898, 118, (1898). Miller J. H. Monog. Univ. Puerto Rico B 2, 208, (1934).
sub *Hypoxylon heliscus* Montagne J. F. C. Ann. Sci. Nat. II, 13, 355, (1840).

Stromata pulvinate, $0.9-1.9 \times 1.5-2.4 \times 0.5-1.8\mu$, with one or several (<20) clavata per stroma, on distinct stipes $0.5-1.0 \times 0.7-2.0\mu$. Subiculum present, rough, densely matted, dull brown to purple brown; hyphae sparingly branched, rosy, uniform, $1.8-4.5\mu$ in diameter. Ectostroma persistent, crustose, continuous or splitting in polygonal crusts, dull brown to black. Entostroma outwardly carbonaceous, black; basal tissue fleshy or corky, solid, dull white to cream. Perithecia 2-8 per clava, immersed, globose, $500-600 \times 500-700\mu$; ostioles medium or prominent papillate. Asci cylindric, $115-135 \times 4-5\mu$; spores gibbous to navicular narrow ended, dark brown, $3.5-7.0 \times 8.5-14.0\mu$, ave. $5.3 \times 11.2\mu$.

Material examined:

Copeland; on *Ficus*, Las Banas, Philippines (1932), (NYBG). Martin 1510; San Blàs, Nayarit, Mexico, (1962).

Cultural characters: (Plate V:1, 2. See also Martin (1967) Plate V:5):

Colonies velvet-felty, serial mycelium somewhat plumose but otherwise uniform, pure white. Margin distinct, entire, plumose, hyphae compact. Carbonization extensive. Growth moderate, 2.3 mm/day at 25°C.

Microscopic characters:

Primary mycelium undiagnostic, maximum diameter or marginal hyphae = 1.2μ . Secondary mycelium loose, $1.2-2.5\mu$ in diameter.

Conidiophores and conidia (Plate VII:6). See also Martin (1967) Plate V:5.

The conidiophores are borne on small rosy coremia, $0.3-5.5 \times 3.2-18$ mm, that are unbranched or with up to 5 branches. Each whole coremium or

sector is curved, aristate or fan shaped, without dark mycelium, white, with sporadic fertile areas. The conidiophores are developed irregularly, $135-160 \times 1.5-4.5\mu$, and are branched dichotomously or ternately to the second degree or indefinitely. The fertile branches are borne in trident formation, swollen clavate but smooth in outline, with unspecialized to distinct globose heads, $4.3-11.2 \times 1.5-3.7\mu$, Conidia acrogenous, sessile, clavate with narrow rounded distal ends and narrow truncate bases, pale grey, $1.2-1.6 \times 0.7-0.9\mu$, ave. $1.3 \times 0.9\mu$.

Xylaria Hill, J. D. A General Natural History of the Animals, Vegetables and Minerals, 62, (1751).

This is the oldest genus of the Xylariaceae and still the best known. Customarily recognized by the cylindrical shape of the stroma and the black surface covering a white interior, the fungi included here also represent a somewhat radical departure from all the other genera except *Thamnomycetes* in that the perithecia are oriented horizontally instead of vertically in relation to the growing apex, and the fertile portion is raised above the substrate level through development of a stipe.

Dennis (1957) has followed Dumortier (1822) in adoption of the term *Xylosphaera* for the genus. The writer regards this as serving little purpose: the name *Xylosphaera* is little known in contrast to *Xylaria*, and Dumortier's definition adds nothing to, nor detracts from, the original definition of the genus. Recently (see Report, 1968) *Xylaria* was conserved against *Xylosphaera*.

The genus *Xylobotryum* Patouillard (1895) is excluded from *Xylaria* on account of the reported biseptate nature of the spores of the type, *X. andinum* Pat. No type material in the genus has been examined except that of *X. rickii* Lloyd. This species is misplaced since it is a good *Xylaria*.

PLATE II. Stromata (Cont.)

1. *Xylaria avellana* $\times (1.6)$
2. *Xylaria fibula* $\times (1.6)$
3. *Xylaria cranioides* $\times (1.6)$
4. *Xylaria macrospora* $\times (1.6)$
5. *Xylaria berteri* $\times (1.8)$
6. *Xylaria enterogena* $\times (1)$
- 7, 8. *Xylaria anisopleura*: Variation from sessile to stipitate stroma $\times (1)$
- 9—12. Surface views of stromata
9. *Xylaria dealbata* (Xyloglossa) $\times (1)$
10. *Xylaria enterogena* (Xyloglossa) $\times (6)$
11. *Xylaria comosa* (Xylorugosa) $\times (6)$
12. *Xylaria hypoxylon* (Xylorugosa) $\times (6)$
13. *Xylaria leprosa* $\times (0.4)$
14. *Xylaria castorea* $\times (0.4)$
15. *Xylaria fioriana* $\times (0.4)$



The same is concluded for the monotypic *Trachyxylaria* Möller (1901), because the spores are also reported as bisepitate. Further type material as well as that freshly collected has to be examined before determining the true relationship of these little-known fungi.

Xylaria has been traditionally divided into 4 sections dating from Fries (1851):

A. clava undique fertili	
a. stipite glabro	Xyloglossa
b. stipite vestito	Xylocoryne
B. Clava apice sterili	
a. stipite glabro	Xylostyla
b. stipite villosa	Xylodactyla

The evaluation of these as natural taxonomic units is difficult though the system is reasonably practicable as a broad artificial basis for the separation of species. The selection of only two characters, the presence or absence of a sterile apex and subiculum leads, however, to too much overlapping. Furthermore, it is difficult to know which one should take priority, since both are variable. The writer takes the view that there are no sharp lines between these four classes, and that there are several common species, including *X. polymorpha*, *X. curta*, *X. arbuscula*, and *X. anisopleura* that show a sufficiently wide degree of interspecific variation as to render the basis of this classification untenable.

The genus *Xylaria* is best defined, and its division into natural units facilitated, by two refinements. Firstly, those species without an ectostroma should be placed in *Podosordaria*, for reasons given later. Secondly, if the nature of the ectostroma, whether smooth and continuous or rough and divided into plaques, is given precedence over other characters, the two resultant groups within *Xylaria* show much less overlap in character and there are very few intermediate species.

PLATE III. Stromata (Concl.)

1—3. Asci and spores

1. *Xylaria anisopleura*: Young and mature asci with prominent apical plugs $\times$ (210)
2. *Xylaria tabacina*: Spores with spiral germ slits $\times$ (540)
3. *Poronia punctata*: Spores with linear germ slits and gelatinous sheaths $\times$ (540)
4. *Podosordaria macrorrhiza* $\times$ (3)
5. *Poronia punctata*: White ectostroma and black ostioles $\times$ (6)
6. *Poronia oedipus*: Multiclavate stromata $\times$ (3)
7. *Poronia punctata* $\times$ (1·5)
- 8, 9. *Podosordaria leporina*
8. $\times$ (1·5)
9. $\times$ (6)
10. *Podosordaria plumosa* $\times$ (2)
11. *Podosordaria hippotrichioides* $\times$ (7)



Section 1. *Xyloglossa* Fries (Plate II:9, 10):

Stromata usually large, clavate, often with bulbous apices and decussate or ill-differentiated stipes. Surface of stroma smooth; ectostroma continuous or nearly so, usually variously coloured or some shade of brown or purple-grey becoming black with age. Perithecia variously oriented, immersed or very rarely evident in outline, developed over the entire clava. Subiculum infrequent, and not well developed when present.

Section 2. *Xylorugosa* Martin (Plate II:11, 12):

Stromata extremely variable in size and shape, pulvinate, linear, or clavate; apices not usually bulbous. Surface of stroma verrucose, rarely smooth; ectostroma continuous or broken up into linear or polygonal corky plaques that may remain visible at maturity or become partially absorbed into the entostromal crust or flake off. Usually the ectostroma is some shade of light or dark brown at maturity, though white initially. Perithecia usually lateral, occasionally variously oriented, often vaguely evident or easily discernible in outline, developed over the entire clava or absent at the top so that the apex is umbonate or linear. Subiculum characteristic, sometimes tomentose covering the stipe and base of the stroma.

The division below this level, especially in the second and larger group, however, does become arbitrary due to the inconstant correlation of characters. Those species, for example, corresponding to Fries' section *Xylodactyla* which show a preference for seed coats and various substrates which are not lignicolous, are also linear in form. However, there are several others of similar form that occur on wood along with the bulbous and clavate types. Likewise, several species, e.g. *X. anisopleura*, previously referred to, exhibit pulvinate, cylindric and clavate stromata, sometimes without a stipe. The writer has thought fit to include several species of *Penzigia* together with polymorphic species of *Xylaria* that vary from pulvinate to cylindric (e.g. *X. anisopleura*), or which have separate perithecia as a separate subgroup within *Xylorugosa*. This stromal polymorphism is paralleled by variation in form of development of conidiophores from parallel to irregular on various types of coremium (see Plates II & VII). In the other species of *Xylorugosa* the stroma is consistently cylindric and the conidiophores always in parallel arrangement on an anistate coremium.

Following is a key to some of the species, drawn from the literature and authentic material:

- | | | |
|----|--|----|
| 1' | Ectostroma forming a smooth crust at maturity, without furrows, continuous or minutely areolate or cracked; sometimes brightly coloured. Apex rarely infertile (sect. <i>Xyloglossa</i>)..... | 2 |
| 1' | Ectostroma rugose or tomentose, continuous or forming linear or polygonal plaques at maturity; surface characteristically furrowed between the perithecia, usually dull brown to black. Apex fertile or produced as a sterile point. (sect. <i>Xylorugosa</i>)..... | 19 |
| 2 | Subiculum absent, stromal apex sterile or fertile..... | 3 |
| 2' | Subiculum present, apex fertile..... | 12 |
| 3 | Apex sterile; ectostroma fawn brown to dull brown or grey; spores crescentic, narrow ended, medium brown, with spiral germ slits, 7.0—8.0 × 42.0—42.5 μ
<i>Xylaria platypoda</i> (Lév.) Fries | |
| 3' | Apex fertile..... | 4 |
| 4 | Spores with spiral germ slits..... | 5 |
| 4' | Germ slits straight..... | 6 |
| 5 | Ectostroma dull white, basal tissue dull white to grey; stroma clavate to obovate; | |

- spores navicular to crescentic with acute or mucronate ends, medium to dark brown, $8\cdot0\times 29\cdot0\mu$
- Xylaria ridleyi* Massee
- 5' Ectostroma cream or yellow, entostroma cream at centre; stroma usually clavate, narrowing down to the base; spores navicular to crescentic, narrow ended, medium to dark brown, $6\cdot5-7\cdot5\times 17\cdot0-20\cdot0\mu$
- Xylaria enterogena* Montagne
- 5' ' Ectostroma burgundy brown, entostroma dull yellow to black at centre; stipe distinct; spores crescentic, narrow ended, dark brown, $7\cdot0-7\cdot5\times 17\cdot5-24\cdot0\mu$
- Xylaria telfairii* Berkeley
- 6 (4) Ectostroma white at maturity 7
- 6' Ectostroma some shade of brown 9
- 7 Stroma large; clava hemispheric or pileate, with a long robust stipe; spores equilateral, broad ended, dark brown, with prominent sheaths, $6\cdot0\times 13\cdot5\mu$
- Xylaria agariciformis* Cooke & Massee
- 7' Stroma clavate or cylindric 8
- 8 Stroma clavate to obovate; spores gibbous to navicular, with acute ends or mucronate, dark brown to black, $7\cdot0-7\cdot5\times 28\cdot0-31\cdot0\mu$
- Xylaria dealbata* Berkeley & Broome (Plate II:9)
- 8' Stroma cylindric; spores equilateral, broad-ended, amber to pale brown, $3\cdot0\times 6\cdot5\mu$
- Xylaria muscula* Lloyd
- 9 (6) Spores clearly appendiculate, or in old material appearing with one end acute and the other broad or truncate, navicular to crescentic, medium brown, $7\cdot0\times 21\cdot5\mu$. Stromata brown to purple brown, involute
- Xylaria involuta* Klotzsch
- 9' Spores not appendiculate, with both ends similar 10
- 10 Spores not exceeding 15μ long 11
- 10' Spores $6\cdot5\times 19\cdot0\mu$; crescentic, narrow ended, dark brown; stroma large usually 30 mm long, cylindric with sunken perithecia
- Xylaria olobapha* Berkeley
- 11 Stromata cylindric, spores with acute ends, gibbous, medium brown, $4\cdot5\times 8\cdot5-10\cdot0\mu$
- Xylaria plebeja* Cesati
- 11' Stromata clavate, spores with broad or narrow ends, gibbous to navicular, amber to medium brown, $4\cdot0-5\cdot5\times 11\cdot0-14\cdot0\mu$
- Xylaria allantoides* Berkeley
- 12 (2) Spores with spiral germ slits 13
- 12' Germ slits straight 14
- 13 Ectostroma cream or yellow; stromata usually clavate, narrowing down to the base; spores navicular to crescentic, narrow ended, medium to dark brown, $6\cdot5-7\cdot5\times 17\cdot0-20\cdot0\mu$
- Xylaria enterogena* Montagne (Plate II:6, 10)
- 13' Ectostroma burgundy to dull brown; stromata clavate but with a distinct stipe; spores navicular to crescentic, narrow-ended, dark brown, with prominent sheaths, $7\cdot0\times 20\cdot0\mu$
- Xylaria tabacina* (Kickx.) Berkeley (Plate III:2)
- 14 (12) Ostioles papillate, in the centre of a conspicuous circular raised or depressed area, dark or covered with white granular material, sometimes also with a white or brown rim; ectostroma purplish brown then dull fuscous to black, spores crescentic, broad ended, dark brown, $4\cdot5-6\cdot0\times 10\cdot0-16\cdot5\mu$
- Xylaria guianensis* Montagne
- 14' Ostioles not annulate 15
- 15 Stromata globose to oval, with outer layer smooth or minutely and reticulately cracked, fuscous grey with ostioles darker but often indistinct; spores crescentic, with broad or narrow ends, dark brown, $5\cdot5-8\cdot5\times 24\cdot5-25\cdot0\mu$
- Xylaria obovata* Berkeley
- 15' Stromata clavate or cylindric 16
- 16 Stromata of moderate size, not more than 7 cm long and 1.5 cm diam. 17
- 16' Stromata large, at least 7 cm long and 1 cm diam. 18

- 17 Spores equilateral to gibbous, narrow ended, dark brown to black, $3.5-4.5 \times 7.5-8.0\mu$; ectostroma dull murky brown; stromata gregarious, not > 37 mm high
Xylaria cubensis Montagne
- 17' Spores gibbous to crescentic, with narrow distal ends, dark brown, $4.0-5.0 \times 8.0-12.0\mu$; ectostroma burgundy brown; stromata solitary up to 65 mm high, somewhat twisted
Xylaria myosurus Montagne
- 18 (16) Stipes very short; clavate massive up to 20 cm long; ectostroma dark purple grey; spores gibbous to crescentic, narrow ended, dark brown to black, $5.0-6.5 \times 12.5-15.5\mu$
Xylaria poitei (Lév.) Fries
- 18' Stipes well developed, up to 4 cm long; clavata up to 7 cm long; ectostroma purplish grey with white streaks; spores gibbous to navicular, narrow ended, dark brown, $6.5 \times 19.5\mu$
Xylaria conocephala Berkeley & Curtis
- 19 (1) Subiculum absent, apex fertile.....20
 19' Subiculum absent, apex sterile.....33
 19'' Subiculum present, apex fertile.....36
 19''' Subiculum present, apex sterile.....56
 20 Stipe not developed, stroma attached at centre only.....21
 20' Stipe evident though sometimes decussate from clava.....28
 21 Spores less than 20μ long.....22
 21' Spores greater than 20μ long.....25
 22 Entostromal crust containing orange particles visible on inspection; spores equilateral, broad ended, medium brown, $5.5 \times 10.5\mu$
Xylaria cinnabarina Cooke & Massee
- 22' Entostroma crust entirely black.....23
 23 Spores navicular, narrow-ended, medium brown, with linear or spiral germ slits, $6.0 \times 13.5\mu$; stromata small pulvinate
Xylaria ayresii (Berk. & Cke.) Martin
 syn. *Penzigia ayresii* (Berk. & Cke.) Miller
- 23' Spores equilateral or gibbous with straight germ slits.....24
 24 Stromata applanopulvinate to oval or circular, 9-35 mm diam., with convex or flattened surface and concave undersurface, attached at one narrow point only; spores gibbous or equilateral, narrow ended, black, $6.5-8.0 \times 11.0-13.5\mu$
Xylaria enteroleuca (Speg.) Martin
 syn. *Penzigia enteroleuca* (Speg.) Miller
Hypoxylon enteroleucum Spegazzini
- 24' Stroma pulvinate, 4-19 mm diam. with convex surface and flat undersurface, with broad central attachment, spores $5.0 \times 11.5\mu$
Xylaria berteri (Mont.) Cooke
 syn. *Penzigia berteri* (Mont.) Miller
Hypoxylon berteri Montagne
- 25 (21) Spores with spiral germ slits; stroma usually variable in form; ectostromal plaques polygonal, dull brown, entostroma dull yellow, ostioles prominent papillate; spores navicular to crescentic, with narrow or acute ends, dark brown $6.5-11.0 \times 18.0-29.5\mu$
Xylaria anisopleura (Mont.) Fr.
 syn. *Xylaria scruposa* Fr.
Xylaria tuberiformis Berk.
Kretzschmaria rugosa Earle
- 25' Germ slits straight.....26
 26 Stromata large, globose or pulvinate, 14-27 mm diam., 10-15 mm high; ectostrome ochre brown, entostroma dull yellow at centre; spores navicular to crescentic, acute ended, dark brown, $9.0 \times 30.0\mu$
Xylaria cranioides (Sacc. & Paol.) Martin (Plate II:3)
 syn. *Penzigia cranioides* Sacc. & Paol.
- 26' Stromata smaller, not exceeding 11 mm diam. and 6 mm high.....27
 27 Perithecia $600-700 \times 700-800\mu$; spores navicular to crescentic, narrow ended, dark brown, $8.5 \times 24.5\mu$
Xylaria fibula Massee (Plate II:2)

- 27' Perithecia 700—800 × 1200—1300 μ ; spores navicular to crescentic, broad-ended, dark brown, 10·0 × 33·0 μ
Xylaria avellana (Ces.) Martin (Plate II:1)
 syn. *Penzigia avellana* (Ces.) Miller
- 27' Perithecia 1200—1800 × 1500—1800 μ ; spores equilateral, narrow ended, medium to dark brown, 17·5 × 39·0 μ
Xylaria macrospora (Penz. & Sacc.) Martin (Plate II:4)
 syn. *Penzigia macrospora* Penzig & Saccardo
- 28 (20) Spores 6·5—11·0 × 18·0—29·5 μ , navicular to crescentic, with narrow or acute ends, dark brown; germ slits spiral
Xylaria anisopleura (Mont.) Fries
 syn. *Xylaria scruposa* Fries
Xylaria tuberiformis Berkeley
Kretzschmaria rugosa Earle
- 28' Spores less than 20 μ long; germ slits straight.....29
- 29 Stromata clavate, or oblong to ovate or cylindric.....30
- 29' Stromata strictly linear cylindric.....32
- 30 Spores crescentic, stromata robust, usually of fairly large size.....31
- 30' Spores gibbous, with narrow ends, dark brown, 6·0 × 10·5 μ ; stromata of moderate size, up to 4 mm long. On seeds, often buried in soil.
Xylaria oxyacanthae Tulasne
- 31 Ectostroma plaques yellow ochre, turning dull brown, square or circular; stromata oblong to ovate; spores crescentic, narrow ended, medium brown to black, 4·0—5·0 × 9·0—10·5 μ
Xylaria curta Fries
- 31' Ectostroma plaques dull brown to black, verrucose; stromata ovate to cylindric; spores crescentic with narrow ends, medium brown, 7·0 × 12·0 μ 29
Xylaria clavata Scopoli
- 32 (29) Basal tissue beneath crust coloured yellow; ectostroma black, surface wrinkled; spores equilateral to navicular with narrow or acute ends, 4·5—5·0 × 9·0—11·0 μ
Xylaria luteostroma Lloyd
- 32' Basal tissue dull white; ectostroma dull brown, surface almost smooth; spores navicular, narrow ended, pale to medium brown, 4·5 × 12·0 μ
Xylaria papyriferi (Link.) Fries
- 33 (19) Spores with spiral germ slits, gibbous, acute-ended, medium brown, 5·0 × 16·5 μ ; ectostroma yellow ochre; basal tissue dull white; perithecia evident
Xylaria juruensis Hennings
- 33' Germ slits straight.....35
- 34 Ectostroma light-coloured, perithecia evident.....35
- 34' Ectostroma darker coloured, perithecia vaguely evident to immersed.....36
- 35 Ectostroma yellow ochre, basal tissue pure white, perithecia evident; spores gibbous to navicular, with narrow or acute ends, dark brown, 9·0 × 30·0 μ
Xylaria luxurians (Rehm) Lloyd
- 35' Ectostroma white; basal tissue cream; perithecia evident; spores navicular, narrow ended, dark brown, 4·0 × 8·5 μ
Xylaria coccophora Montagne
- 36 (34) Stromata small, not more than 4 mm high; perithecia globose in outline; basal tissue white to dull yellow; spores navicular to crescentic, broad-ended, medium brown, 4·5 × 11·0 μ
Xylaria citrina Massee
- 36' Stromata larger, perithecia evident or immersed, basal tissue differently coloured 37
- 37 Ostioles in truncate depressions; clavata cylindric, black with ectostroma poorly preserved; spores navicular to crescentic, broad ended, medium brown, 5·0 × 10·5 μ
Xylaria gracilentia Sydow
- 37' Ostioles not in truncate depressions.....38
- 38 Stromata narrow, basal tissue white, perithecia sunken or vaguely evident, not close crowded; spores with prominent gelatinous sheaths, navicular, narrow-ended, dark brown, 5·5 × 13·0 μ
Xylaria arbuscula Saccardo

- 38' Stromata robust, clavate, basal tissue cream; perithecia moriform, close crowded; spores without sheaths, gibbous, with broad or narrow ends, medium brown, $5.0 \times 11.0 \mu$
Xylaria varians Saccardo
- 39 (19) Spores with spiral germ slits.....40
 39' Germ slits straight.....42
- 40 Ectostroma yellow ochre, forming polygonal plaques; stroma short clavate; spores crescentic, mucronate, medium to dark brown, $7.5-8.0 \times 28.0-29.5 \mu$
Xylaria comosa Montagne (Plate II:11)
- 40' Ectostroma differently coloured at maturity.....41
- 41 Ectostroma dull brown, continuous or composed of linear or polygonal plaques, sometimes intermediate on the same specimen; clava pulvinate to clavate or cylindric, stipe absent or well developed; spores navicular to crescentic, with narrow or acute ends, dark brown, $6.5-11.0 \times 18.0-29.5 \mu$
Xylaria anisopleura (Mont.) Fries
 syn. *Xylaria scruposa* Fries
Xylaria tuberiformia Berkely
Kretzschmaria rugosa Earle
- 41' Ectostroma fawn brown to black, forming scabrid linear or polygonal plaques, sometimes intermediate in the same species; clava clavate or cylindric; stipe always present; spores navicular to crescentic, narrow ended, dark brown, $5.5-6.0 \times 12.0-13.0 \mu$
Xylaria longipes Nitschke
- 42 (39) Spores appendiculate, gibbous to crescentic, with narrow distal ends, dark brown to black, $5.0-5.5 \times 10.0-13.0 \mu$; stromata very narrow, less than 2 mm diameter
Xylaria gracillima Fries
- 42' Spores not appendiculate.....43
- 43 Basal tissue dull yellow; stromata narrow cylindric; spores oval, equilateral to navicular with narrow or acute ends, $4.5-5.0 \times 9.0-11.0 \mu$
Xylaria luteostroma Lloyd
- 43' Basal tissue white or cream.....44
- 44 Stromata of moderate size, narrow cylindric, $1.5-3$ mm diam., on seeds including palm nuts.....45
- 44' Stromata more robust, at least 2 mm diam; substrate dead wood.....46
- 45 On palm nuts; spores gibbous to navicular, narrow ended, dark brown, $5.5 \times 10.5 \mu$
Xylaria palmicola Rehm
- 45' On deciduous fruits; spores gibbous, narrow ended, dark brown, $6.0 \times 10.5 \mu$
Xylaria oxyacanthae Tulasne
- 45' ' On deciduous fruits; spores gibbous to navicular, narrow ended, dark brown, $7.0 \times 15.0 \mu$
Xylaria bruneriana Seaver
- 46 (44) Stroma smooth, not furrowed or corrugated; perithecia entirely immersed; stroma cylindric; spores crescentic, narrow ended, dark brown, $7.0 \times 17.5 \mu$
Xylaria euglossa Fries
- 46' Stromal surface wrinkled or furrowed; perithecia immersed or evident in outline 47
- 47 Ectostroma light coloured.....48
- 47' Ectostroma chestnut brown to black.....50
- 48 Ectostroma white, stroma clavate; spores navicular, narrow ended, black, $7.0 \times 23.0 \mu$
Xylaria fockei (Miguel) Saccardo
- 48' Ectostroma fawn to pale brown; stroma clavate; spores narrow-ended, dark brown, of two types: oval, gibbous, $4.0 \times 8.5 \mu$; and elliptic, navicular to crescentic, $5.5 \times 13.5 \mu$
Xylaria rhopalopsis Ellis & Everhart ined?
- 48' ' Ectostroma yellow ochre.....49
- 49 Clavata of moderate size, $12-35$ mm long; interior pure white; spores crescentic, narrow ended, medium brown to black, $4.0-5.0 \times 9.0-10.5 \mu$
Xylaria curta Fries
- 49' Clavata usually large, $70-80$ mm long; interior dull yellow to grey; spores crescentic, narrow-ended, dark brown, $5.0 \times 12.0 \mu$
Xylaria grammica Montagne

- 50 (47) Spores greater than 15μ long.....51
 50' Spores less than 15μ long.....52
 51 Ectostroma dull brown, basal tissues pure white, stromata usually variable in form; spores navicular to crescentic with narrow or acute ends, medium to dark brown, $7\cdot0-9\cdot0\times21\cdot5-27\cdot0\mu$
Xylaria polymorpha (Pers.) Greville
 51' Stromata linear cylindric, $2\cdot5-3\times13-21$ mm; ectostroma in long plaques; perithecia close crowded; spores crescentic, narrow ended, dark brown, with prominent sheaths, $6\cdot5-7\cdot0\times15\cdot0-19\cdot0\mu$
Xylaria berkeleyi Montagne
 52 (50) Perithecial vertices hemispheric, evident in outline.....53
 52' Perithecia sunken or vaguely evident only.....54
 53 Ectostroma yellow or dull brown to black, usually in polygonal plaques; clavata stipitate, usually fairly stout; spores crescentic, narrow-ended, medium brown to black, without prominent sheaths, $4\cdot0-5\cdot0\times9\cdot0-10\cdot5\mu$
Xylaria curta Fries
 53' Ectostroma dull brown, usually semi-continuous and composed of coarse hyphae; clavata stipitate or sessile, pulvinate to stout cylindric; spores equilateral, broad ended, medium to dark brown, with prominent sheaths, $5\cdot5\times10\cdot5\mu$
Xylaria fioriana Saccardo
 53' ' Ectostroma dull brown to black, in small linear plaques, inconspicuous; clavata linear or narrow clavate; spores navicular to crescentic, narrow-ended, medium brown, $8\cdot0\times19\cdot0\mu$
Xylaria bififormis Lloyd
 54 (52) Stromata broad clavate, sometimes with pannose base; ectostroma in polygonal crusts; spores gibbous, broad-ended, dark brown $4\cdot0-6\cdot0\times8\cdot5-10\cdot0\mu$
Xylaria castorea Berkeley
 54' Stromata linear cylindric, $1\cdot5-3\times6-38$ mm.....55
 55 Ectostroma continuous or formed of closely aligned plaques; spores gibbous, broad ended, black, without prominent sheaths, $4\cdot5\times8\cdot5\mu$
Xylaria rhytidophloea Montagne
 55' Ectostroma in polygonal or linear crusts; spores gibbous, with broad or narrow ends, dark brown, with prominent sheaths, $5\cdot0\times10\cdot0\mu$
Xylaria rhopaloides Montagne
 56 (19) Spores with spiral germ slits.....57
 56' Germ slits straight.....59
 57 Ectostroma continuous or nearly so, dull-brown, composed of coarse hyphae; stromata usually robust, linear to cylindric; spores navicular, broad ended, dark brown, with prominent sheaths, $6\cdot0\times17\cdot5\mu$
Xylaria leprosa Spegazzini
 57' Ectostroma forming scabrid plaques or closely appressed mycelium.....58
 58 Ectostroma black; spores navicular to crescentic with narrow ends, dark brown, $5\cdot5\times16\cdot5\mu$
Xylaria acuta Peck
 58' Ectostroma yellow ochre, fawn brown or dull brown; spores gibbous to crescentic, narrow ended, dark brown to black, $6\cdot0-7\cdot0\times13\cdot5-18\cdot5\mu$
Xylaria cornudamae Schweinitz
 59 (56) Spores appendiculate, gibbous to crescentic, with narrow distal ends, dark brown to black, $5\cdot0-5\cdot5\times10\cdot0-13\cdot0\mu$. Stromata slight, less than 2 mm diameter, with scanty ectostroma.
Xylaria gracillima Fries
 59' Spores not appendiculate.....60
 60 Basal tissue white or pale grey.....61
 60' Basal tissue dull yellow; stromata narrow cylindric, sometimes with truncate papillate ostioles; spores oval, equilateral to navicular with narrow acute ends, $4\cdot5-5\cdot0\times9\cdot0-11\cdot0\mu$
Xylaria luteostroma Lloyd
 61 Ostioles in the centre of small truncate discs on the stromal surface.....62
 61' Ostioles not annulate.....64

- 62 Stromal surface wrinkled, subiculum usually coarse shaggy and dull brown; ectostroma fawn brown, turning black with age; ostioles not conspicuous; spores gibbous to crescentic, narrow ended, medium to dark brown, $4.5-6.5 \times 9.5-13.5 \mu$
- 62' Stromal surface smooth 63
Xylaria hypoxylon Greville
- 63 Stromal surface smooth; subiculum usually smooth, red brown, ectostroma purple grey; ostioles easily seen, surrounded by a white granular deposit; spores navicular to crescentic, broad ended, medium to dark brown, $4.5 \times 10.0 \mu$
Xylaria cristata Spegazzini
- 63' Stromal surface smooth; subiculum smooth, red-brown, limited in quantity, ectostroma dark brown to black; ostioles not conspicuous; spores gibbous narrow-ended, medium brown, $5.5 \times 10.5 \mu$. Stromata linear cylindric, multibranched
Xylaria tuberosa (Pers.) Cooke
- 64 (61) Ectostroma clearly developed at maturity 65
- 64' Ectostroma slight at maturity; stromata robust though narrow; perithecia clearly evident; ostioles simple or in truncate depressions; spores gibbous to navicular narrow-ended, dark brown, $9.5 \times 24.0 \mu$
Xylaria theissenii Lloyd
- 65 Perithecia evident in outline 66
- 65' Perithecia vaguely evident or immersed 69
- 66 Ectostroma yellow ochre; spores gibbous, with broad or narrow ends, medium brown, $5.0 \times 11.0 \mu$; on beech nuts
Xylaria carpophila Fries
- 66' Ectostroma dull brown; substrate otherwise 66
- 67 Perithecia close crowded and projecting, conic to moriform; stromata variable in size but often massive, cylindro-clavate with several branches; spores navicular, narrow ended, medium brown, $4-5 \times 8-10 \mu$
Xylaria bulbosa (Pers. ex Fr.) Berkeley & Broome
- 67' Perithecia adjacent, not moriform; stromata of moderate size usually linear . . . 67
- 68 Stipes less than 17 mm long, ectostroma semi-continuous, composed of coarse hyphae; on palm nuts and stems; gibbous to crescentic, with narrow ends, pale to medium brown, $4.0-4.5 \times 10.0-11.0 \mu$
Xylaria ianthino-velutina Montagne
- 68' Stipes 20—52 mm long, ectostroma in linear plaques of closely appressed hyphae; on dicotyledonous wood; spores crescentic, narrow ended, pale brown, $4.0 \times 9.5 \mu$
Xylaria rickii (Lloyd) Martin
syn. *Xylobotryum rickii* Lloyd
- 69 (65) Ectostroma continuous, worn off at random, or partly striate 70
- 69' Ectostroma in distinct plaques 71
- 70' Clavata globose or pulvinate, terminating in a white sterile truncate or lobed apex; ectostroma white, turning black, appressed mattose, continuous; spores crescentic, narrow ended, dark brown, $4.5 \times 10.5 \mu$
Xylaria readeri Müller
- 70' Clavata spatulate or cylindric; ectostroma dull yellow, worn off at random or merging with the purple grey carbonaceous crust; spores $3.5 \times 7.0 \mu$
Xylaria brasiliensis (Theiss.) Lloyd
- 71 (69) Ectostroma yellow ochre, plaques polygonal; spores crescentic, mucronate, medium to dark brown, $7.5-8.0 \times 28.0-29.5 \mu$
Xylaria comosa (Mont.) Fries
- 71' Ectostroma various, plaques linear 72
- 72 Stipe not distinct from the clava, very short; ectostroma scabrid and prominent, yellow to dull pink or brown; stromata small in size; spores navicular to crescentic, narrow ended, medium brown, $4.0 \times 9.0-9.5 \mu$
Xylaria inaequalis Berkeley & Curtis
- 72' Stipe clearly developed; stromata often branched 73
- 73 Spores $> 20 \mu$ long 74
- 73' Spores $< 20 \mu$ long 75

- 74 Ectostroma light yellow or brown; spores gibbous to navicular, narrow ended, medium to dark brown, with prominent sheaths, $6\cdot0-8\cdot0\times16\cdot0-24\cdot5\mu$; stroma usually linear-cylindric
Xylaria apiculata Cooke
- 74' Ectostroma dull brown; spores navicular to crescentic with narrow or acute ends, medium to dark brown, $7\cdot0-9\cdot0\times21\cdot5-27\cdot0\mu$; stromata various
Xylaria polymorpha (Pers.) Greville
- 74'' Ectostroma dull brown; spores navicular to crescentic, with narrow or acute ends, medium to dark brown, $5\cdot0\times15\cdot5\mu$; stromata various but apices often spatulate; parasitic on apple and other deciduous fruit trees
Xylaria mali Fromme
- 75 (73) Stromata on wood.....76
- 75' Stromata occurring on dead grass stems; linear cylindric; ectostroma initially white and remaining partly so at maturity, otherwise turning light brown; spores gibbous, narrow ended, dark brown, $5\cdot0\times10\cdot5\mu$
Xylaria graminicola Gerard
- 76 Stipes of the filiform stromata revolute; spores navicular to crescentic, narrow ended, dark brown, $4\cdot5\times10\cdot0-10\cdot5\mu$
Xylaria scopiformis Montagne
- 76' Stipes not revolute, stromata more robust.....77
- 77 Stroma; surface smooth, ectostromal plaques elongate.....78
- 77' Stromal surface furrowed, ectostromal plaques short.....80
- 78 Ostioles prominent papillate; spores gibbous, narrow ended, dark brown to black, $4\cdot5\times9\cdot0\mu$
Xylaria feejeensis Berkeley
- 78' Ostioles papillate but not conspicuous.....79
- 79 Spores $4\cdot5-5\cdot0\times9\cdot5-11\cdot5\mu$
Xylaria multiplex Saccardo
- 79' Spores $6\cdot0\times13\cdot0\mu$, navicular, narrow-ended, dark brown, with prominent gelatinous sheaths
Xylaria arbuscula Saccardo
- 80 (77) Stromata exceedingly long, narrow cylindric, stipes 55 mm, clavata 30 mm; spores crescentic, broad ended, medium brown, $6\cdot0\times12\cdot5\mu$
Xylaria subterranea (Schw.) Saccardo
- 80' Stromata narrow cylindric or bulbous, but stipes not exceeding 20 mm and clavata not exceeding 40 mm.....76
- 81 Clavulae cylindric or spatulate, characteristically arising from a stout common base; spores equilateral to gibbous, narrow-ended, $5\cdot0-6\cdot0\times10\cdot5-12\cdot5\mu$
Xylaria digitata (Bruck.) Greville
- 81' Stromata normally unbranched, but if so then without a stout basal portion and clavulae linear cylindric.....77
- 82 Stromata cylindric but usually robust; spores gibbous to crescentic, narrow-ended, medium to dark brown, $4\cdot5-6\cdot5\times9\cdot5-13\cdot5\mu$
Xylaria hypoxylon Greville var *subtrachelina*
 syn. *Xylaria subtrachelina* Hennings
- 82' Stromata narrow cylindric, less than 2 mm diam.; spores crescentic, narrow-ended, medium brown, $5\cdot5\times13\cdot0\mu$
Xylaria bataanensis Hennings

Analysis of Species:

Section Xyloglossa

1. *Xylaria cubensis* Montagne

Berkeley M. J. Jour. Linn. Soc. **10**, 380, (1869). Dennis R. W. G. Kew Bull. **1956**, 432, (1956). Lloyd C. G. Myc. Writ. **5**, : *Xylaria* Notes I, 4, (1918). Miller J. H. Bothalia **4**, 264, (1942). Montagne J. F. C. Ann. Sci. Nat II **13**, 345, (1840); Syll. Crypt. 202, (1856). Parks H. E. Univ. Calif. Publ. Bot. **12**, 49, (1926). Patouillard N. & A. Guillard Bull. Soc. Myc. de Fr. **4**, 107, (1888). Rehm N. Hedwigia **40**, 145, (1901). sub *Hypoxylon cubensis*. Montagne J. F. C. in Sagra: Hist. Cuba 347, (1838—1842).

Stromata gregarious, globose, obovate or clavate, unbranched or once dichotomous; clavata stout, $4.0-10 \times 6.8-12.5 \times 18-37$ mm with fertile apices; stipes distinct, smooth, $1.0-5.5 \times 8.5-38$ mm. Subiculum smooth, dense matted, light brown, hyphae densely branched and closely anastomosed, $1.8-3.1 \mu$ in diameter. Ectostroma crustose, continuous or minutely cracked, medium brown or dull murky brown, black with age. Entostroma smooth, externally carbonaceous, internally fleshy, solid to involute or longitudinally furrowed, pure white to cream. Perithecia always several per stroma, immersed, adjacent, oval, broader than high, $600-800 \times 500-700 \mu$; ostioles medium papillate. Asci cylindric $115-135 \times 5-6 \mu$; stipes $67-79 \mu$. Spores oval, equilateral to gibbous, narrow ended, dark brown to black, $3.5-5.0 \times 7.0-9.0 \mu$, ave. $4.0 \times 7.8 \mu$.

Material examined:

Maguire in NYBG Tropical Expedition to Surinam 24168F; in montane forest, Coppernam River, Surinam, (1944), (NYBG). Martin 1780 ex Carroll 142; Puerto Viejo, Costa Rica, (1962). Rick 384; Porto Novo, Santa Catherina, Brazil, (1928), (NYBG). Thaxter in Miller 8782; Burbank, Tenn., U.S.A., (1896), (NYBG).

Cultural characters (Plate V:14):

Colonies felty to floccose, with coarse texture, uniform, aerial mycelium pure white to pink. Margin distinct, lobed, hyphae compact. Carbonization absent. Growth rate rapid, 4.3 mm/day at 25°C .

Coremia unbranched, straight, clavate to spatulate, without dark mycelium, white at apices, $0.8-2.0 \times 3.5-17$ mm. No conidia observed.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae $= 1.2 \mu$. Secondary mycelium loose, $1.8-2.5 \mu$ in diameter.

2. *Xylaria myosurus* Montagne

Dennis R. W. G. Kew Bull. 1956, 411, (1956). Lloyd C. G. Myc. Writ. 6, 911, (1920), Montagne J. F. C. Ann. Sci. Nat. IV 3, 110, (1855); Syll. Crypt. 206, (1856). Saccardo P. A. Syll. Fung. 1, 311, (1882). Theissen F. Denk. Akad. Wiss. Wien math-naturw. Klasse 83, 56, (1927). Van der Bijl P. Trans. Roy. Soc. S. Afr. 9, 181, (1921).

Stromata solitary, unbranched, clavate, $6.0-8.5 \times 6.5-9.5 \times 20-25$ mm, with fertile apices; stipes distinct, dull brown, smooth, $2.5-3.0 \times 12-13$ mm. Subiculum smooth, dense matted, dull brown; hyphae closely reticulate, $3.7-4.5 \mu$ in diameter. Ectostroma continuous except for minute cracks, burgundy brown. Entostroma smooth, externally black and carbonaceous, internally fleshy, pure white, solid. Perithecia always several per stroma, immersed, adjacent, oval, $400-500 \times 500-600 \mu$; ostioles medium papillate. Asci not seen. Spores gibbous, to crescentic with narrow ends, dark brown, $3.5-5.5 \times 6.0-13.0 \mu$, ave. $4.5 \times 10.1 \mu$.

Material examined:

Lapitan 500 in USDA Mycol. Coll. 71555; on *Strombosia philippinensis*, Mt. Makiling, Laguna, Philippines, (1946), (NYBG). Martin 648 ex Batista; Amazon forest, Brazil, (1961). Martin 1506; San Blas, Nayarit, Mexico, (1962).

Cultural characters (Plate IV:7; Plate V:13):

Colonies velvet felty to floccose, with fine texture, uniform, pure white. Margin distinct, lobed; hyphae compact. Carbonization slight. Growth rate moderate, 2·8 mm/day.

Coremia unbranched, straight, clavate, initially pink, later smoky; sometimes with basal dark mycelium, and with clavate, ochre brown apices, 0·5—1·5 × 4·0—8·0 mm, sterile.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae=2·3 μ . Secondary mycelium loose, 2·2—3·1 μ in diameter.

Section *Xylorugosa*

A. Stromata pulvinate to cylindric, stipes often ill-differentiated; conidiophores developed irregularly as well as in palisade formation, coremia straight aristate or variously shaped.

3. *Xylaria berterii* (Mont.) Cooke (Plate II:5; Fig. I:1)

sub *Hypoxylina peltata* Lloyd C. G. Myc. Writ. 1, 1315, (1924).

sub *Hypoxyton berterii* Montagne

Hennings P. Hedwiga 36, 229, (1897). Montagne J. F. C. in Gay: Hist. Chile VII, 438, (1850); Syll. Crypt. 211, (1856). Rick, J. Ann. Mycol. 5, 28, (1907). Theissen F. Ann. Mycol. 6, 345, (1908); Ibid 7, 151, (1909).

sub *Hypoxyton heinricheri* Bresadola G. Ann. Mycol. 5, 241, (1907).

sub *Sphaeria berterii* Montagne J. F. C. Ann. Sci. Nat. II, 3, 353, (1835).

sub *Xylaria berterii* (Mont.) Cooke Starback K. Bih. Svenska vat. akad. handl. 27, (9) 15, (1901). Cooke M. C. Grevillea 11, 126, (1883).

Stromata aplano—pulvinate, 4—15 × 8·5—19 × 3·8—5·2 mm, often divided into 2 or 3 lobes, normally erumpent through bark from the wood beneath, and sessile or slightly stipitate, depending on whether the latter is hard or soft, but occasionally superficial on exposed areas of wood from which the bark has cracked away formerly. Ectostroma corky when young, later scabrous and breaking into roughly polygonal crusts. Entostroma carbonous above the perithecia, fleshy and white beneath, sometimes with large cavities; decaying shortly after maturity to leave a large hollow space beneath the perithecia. Perithecia situated at the periphery of the stroma, immersed, broadly globose with thick walls, 1000—1200 × 600—900 μ ; ostioles distinctly papillate. Asci long cylindric, 90—160 × 6—9 μ ; stipes 40—110 μ . Spores broadly oval, equilateral, with rounded ends, dark brown to black, 3·5—8·5 × 8·0—14·5 μ , ave. 5·6 × 11·3 μ .

South African hosts: *Olea capensis* (preferred), *Curtisia faginea*, *Maytenus buxifolia* and *Rhus legati*.

Material examined:

Martin 38, 48, 49, 85, 102, 128, 284, 366, 503, 1185; Nature's Valley, Western Cape, South Africa, (1958, 1959, 1962).

Cultural characters (Plate IV:2; Plate V:5):

Colonies velvet fleecy, white, smooth opaque, uniform; margin distinct, entire or lobed, canescent, compact. Carbonization extensive, beginning after 20 days. Coremioid growths are regularly produced, a minority of these developing pale grey conidia. Growth rate moderate, 3.6 mm/day at 20°C. optimum temperature.

Microscopic characters (Fig. II:1):

Primary mycelium undiagnostic, maximum diameter of the marginal hyphae—2.7 μ . Secondary mycelium loose to reticulate, of long branched hyphae 2.1—3.4 μ diameter.

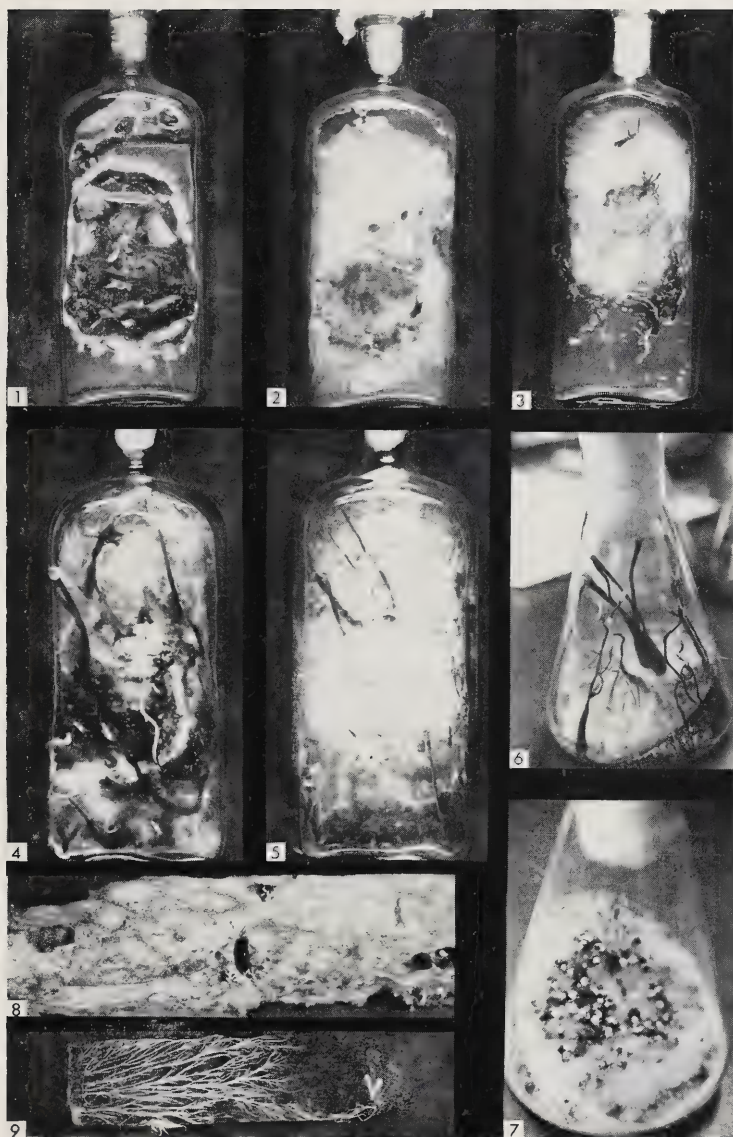
Conidiophores and conida (Fig. II:6, 7):

The coremia vary greatly in size according to the environment: in bottle culture they are large, up to 2 cm long and 1 cm wide, irregular in shape but normally cylindric or coniform, branched once or twice. In plate culture they are much smaller, 1—3 $\times$ 5—7 mm, aristate or clavate, and unbranched or forked. The base of the coremium is dark superficially, while the distal part is white or pink, and fertile. The interior is composed of white fleshy tightly packed pseudoparenchymatous tissue.

The conidiophores are in palisade formation but are irregularly arranged. They are dichotomously or ternately branched to the first or second degree, but do not continue indefinitely as in *K. deusta*; 40—60 $\times$ 1.1—1.9 μ . The fertile hyphae are partly irregular in outline, terete or bulbous, 50—2.0 $\times$ 1.1—3.5 μ . The conidia are pleuracrogenous, oval or elliptic, pale grey collectively, 1.4—2.3 $\times$ 3.7—7.6 μ , ave. 1.7 $\times$ 4.5 μ .

PLATE IV. Cultural Characters

- 1—7. Bottle cultures all on malt agar 2 weeks at 25°C unless otherwise stated
- 8—9. Wood cultures: Water-saturated wood at 25°C for 2 weeks
 1. *Kretzschmaria deusta*: on Czapek, showing extreme carbonization and distortion of medium
 2. *Xylaria berteri*
 3. *Xylaria fioriana*: Conidia arising from coremia and direct from flat mycelium
 4. *Xylaria castorea*
 5. *Xylaria leprosa*
 6. *Xylaria multiplex*
 7. *Xylaria myosurus*
 8. *Xylaria fioriana*: coremia simulating young stromata $\times$ (1)
 9. *Podosordaria plumosa*: mycelial tassels $\times$ (1)



This species is also hard to classify, having some of the stromal characteristics of the Entoleuca section of *Hypoxylon* (*H. discolor* etc.) and others of a true *Xylaria*. It is probably closer to *Xylaria* on account of the typical coremia and general cultural characters.

4. *Xylaria enteroleuca* (Spegazzini) Martin nov. comb.

sub *Hypoxylon enteroleucum* Spegazzini non Kickx

Spegazzini C. Anal. mus. nac. Buenos Aires 6, 264, (1899).

sub *Penzigia enteroleuca* (Speg.) Miller

Chardon C. E. et al. Mycologia 32, 183, (1940). Miller J. H. World Species of *Hypoxylon* 133, (1961).

sub *Nummularia enteroleuca* (Speg.) Patouillard N. Bull. Soc. Myc. de Fr. 22, 56, (1906).

Stromata oval, pulvinate or aplanopulvinate, close together, $3.0-7.0 \times 5.0-35 \times 1.5-17$ mm, unbranched, sessile but attached at a central point to the substrate. Ectostroma forming polygonal crusts, smooth or verrucose, black; entostroma smooth, externally black and carbonaceous, internally pure white and fleshy, solid, but usually concave on the underside. Perithecia always several per stroma, immersed; adjacent, oval, $700-800 \times 800-900\mu$, ostioles medium papillate. Asci cylindric, $130-165 \times 8-9\mu$; stipes $60-84\mu$. Spores oval, equilateral or gibbous with narrow ends, black, $5.0-9.5 \times 9.5-16.5\mu$, ave. $6.7 \times 12.5\mu$.

Material examined:

Martin 1794 ex Carroll 172; University of Costa Rica Botanical Garden, San Pedro, Costa Rica, (1962). Teng 3292; Huna Forest, Kiulungshien, Sikang, China, (1939), (AA). Teng 3513; on *Betula*, Muli, Sikang, China, (1940), (AA).

Cultural characters (Plate V:4; Plate VI:4):

Colonies canescent, appressed, uniform, pure white. Margin not distinct, entire; hyphae compact. Carbonization slight, growth slow, 1.8 mm/day at 25°C.

Coremia unbranched, curved, aristate, clavate or fan shaped, flaring, with dark bases, sterile, or fertile over the apices, $0.6-1.1 \times 5.5-13$ mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae 1.2μ . Secondary mycelium uniform, loose, $1.8-3.7\mu$ in diameter.

Conidiophores and conidia (Plate VII:8):

Conidiophores in palisade formation, rather short, $28-38 \times 1.2-1.8\mu$, unbranched or branched dichotomously to the first degree at the apices. Fertile branches swollen, elliptic, with distinct globose heads, lying freely, $4.3-5.0 \times 2.5-3.8\mu$. Conidia acrogenous, sessile, somewhat thick-walled, clavate with narrow bases, fawn brown en masse, $1.5-2.5 \times 3.1 \times 4.3\mu$, ave. $1.6 \times 3.8\mu$.

This species is similar to *X. berteri*, differing in minor stromal characters, and in the slower growth rate in culture.

5. *Xylaria fioriana* Saccardo (Plate II:15; Fig. I:3, 4).

Saccardo P. A. Ann. Mycol. **8**, 337, (1910); Syll. Fung. **22**, 350, (1913).

Stromata gregarious or close together, rarely solitary, typically unbranched but sometimes with up to 4 branches; clavata pulvinate, clavate or cylindric, $2.0-3.0 \times 3.0-5.5 \times 3.0-20$ mm, with fertile apices, attached evenly, at a central point only, or with an indistinct or definite stipe; stipes longitudinally channelled, $1.5-2.5 \times 0.0-13$ mm. Subiculum smooth, of dense matted hyphae, dull brown; hyphae rosy, $3.5-4.0 \mu$ in diameter. Ectostroma verrucose, predominantly composed of tomentose rather than crustose hyphae, worn off randomly, without obvious cracks or striations except for possible annulate discs around the ostioles, dull murky brown. Entostroma black and carbonaceous externally, internally white and fleshy, solid. Perithecia always several per stroma, evident completely to vaguely evident, adjacent, globose, $200-400 \times 300-600 \mu$; ostioles minute papillate. Asci cylindric, $85-130 \times 6-8 \mu$; stipes $16-39 \mu$. Spores oval, equilateral, with broad ends, subhyaline to translucent, medium to dark brown, with prominent sheaths, $4.5-7.5 \times 8.0-12.0 \mu$, ave. $5.6 \times 10.4 \mu$.

South African Hosts: *Aloe ferox*, *Aloe pluridens*: dead wood and bark, in dry and exposed as well as moist and shady habitats.

Material examined:

Martin 510; Kariega River near Southwell, E. Cape, South Africa, (1958). Martin 635; Grahamstown, E. Cape, (1962).

Cultural characters (Plate IV:3; Plate V:6):

Colonies velvet felty, with fine texture, zonate with 1 or 2 zones, pure white. Margin distinct, lobed; hyphae compact. Carbonization absent. Growth rate moderate, 3.7 mm/day at 25°C .

The coremia are unbranched, relatively short and stout, straight or curved, aristate, initially pink, later white. At maturity there is dark basal mycelium, the lower part of the coremium is covered by long setose hyphae and the distal area is glabrous, pale grey, often producing many conidia.

Microscopic characters (Fig. II:9):

Primary mycelium undiagnostic; maximum diameter of marginal hyphae $= 2.1 \mu$. Secondary mycelium reticulate, vesiculate, $2.2-6.2 \mu$ in diameter.

Conidiophores and conidia (Plate VII: 9; Fig. II:8):

Conidiophores borne off ordinary mycelium or from the coremia, irregularly

or in palisade formation, the latter usually in coremia found growing in nature, $76-82 \times 2.5-3.1 \mu$, branched dichotomously to the second degree distally or over their entire length. Fertile branches narrow, lying freely, $30-41 \times 2.6-3.6 \mu$. Conidia acrogenous, borne on slender sterigmata, oval to elliptic, pale grey collectively, $1.1-1.7 \times 2.3-4.6 \mu$, ave. $1.6 \times 3.5 \mu$.

6. *Xylaria ianthino-velutina* Montagne

Berkeley M. J. Ann. & Mag. Nat. Hist. **10**, 385, (1842). Berkeley M. J. & M. C. Cook. Journ. Linn. Soc. Bot. **15**, 395, (1877). Cooke M. C. Grevillea **11**, 84, (1883). Currey F. Trans. Linn. Soc. Lond. **22**, 264, (1859). Dennis R. W. G. Kew Bull. **1956**, 409, (1956). Von Hohnel F. Denk. Akad. Wiss. Wien math-naturw. klasse **83**, 28, (1927). Lévillé M. J. H. Ann. de Sci. Nat. Bot. III **3**, 45, (1845) sub *Sphaeria*. Lloyd C. G. Myc. Writ. **7**, 1246, (1924): Ibid **7**, 1251, (1924): Ibid **7**, 1354, (1925). Miller J. H. Monog. Univ. Puerto Rico B **2**, 216, (1934): Bothalia **4**, 266, (1942). Montagne J. F. C. Syll. Crypt. **204**, (1856). Rehm H. Ann. Mycol. **5**, 29, (1907). Spegazzini C. Anal. Soc. Sci. Arg. **18**, 279, (1884). Theissen F. Denk. Akad. Wiss. Wien math-naturw. Klasse **83**, 59, (1809). Viégas A. P. Bragantia **4**, 110, (1944). Van der Bijl P. Trans. Roy. Soc. S. Afr. **9**, 181, (1921).

Stromata gregarious, usually close together, unbranched; clavata cylindric, straight or curved, $0.7-1.2 \times 0.8-2.0 \times 2-17$ mm, with elongate sterile apices; stipes distinct or weakly differentiated, dull brown, longitudinally channelled, $0.8-1.1 \times 2-17$ mm. Subiculum rough, dense matted, dull brown; hyphae ropy, $3.7-6.0 \mu$ in diameter. Ectostroma feebly persistent at maturity, composed of tomentose rather than crustose hyphae, worn off randomly without obvious cracks or striations, dull brown. Entostroma externally black and carbonaceous, internally fleshy and pure white, solid. Perithecia always several per stroma, but strongly resembling the individual perithecia of species formerly placed in *Rosellinia* (*Hypoxylon* section Entoleuca), evident completely or above the vertices, set well apart or adjacent, oval, broader than high, $300-400 \times 200-300 \mu$; ostioles medium papillate. Asci cylindric, $80-90 \times 6-9 \mu$; stipes $24-30 \mu$. Spores elliptic, with narrow ends, gibbous, navicular or crescentic, pale to medium brown, $3.0-5.0 \times 9.5-14.5 \mu$, ave. $4.2 \times 10.6 \mu$.

South African hosts:

Nuts and stems of various palms and legumes, including *Cocos*.

Material examined:

Linder 801 in Miller 8843; on legume pod, Bautica, British Guiana, (1924), (NYBG) Martin 1534, 1538, San Blas, Nayarit, Mexico, (1962).

Cultural characters (Plate VI:5):

Colonies velvety, with fine texture, zonate with 1 or 2 zones, pure white. Margin not distinct, entire; hyphae compact. Carbonization absent. Growth rate moderate, 3.0 mm/day at 25°C .

Coremia unbranched, straight or curved, aristate, without dark mycelium, white, fertile over apices and sides, $0.3-0.5 \times 3.5-12$ mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of marginal hyphae $= 2.3\mu$. Secondary mycelium reticulate, $2.2-3.1\mu$ in diameter.

Conidiophores and conidia:

Conidiophores irregular in formation, $75-390 \times 1.5-1.8\mu$, branched to the second degree distally, dichotomous or ternate. Fertile branches lying freely, swollen, clavate, $8.7-15 \times 1.8-4.3\mu$. Conidia acrogenous, sessile, clavate with narrow bases, cineraceous en masse, $1.8-2.5 \times 3.7-5.0\mu$, ave. $2.0 \times 4.4\mu$.

8. *Xylaria anisopleura* Montagne

Berkeley M. J. & C. E. Broome Jour. Linn. Soc. Lond. **14**, 119, (1875). Cooke M. C. Handbook of Australian Fungi 286, (1892). Dennis R. W. G. Kew Bull. **1956**, 439, (1956). Fries E. M. Nova act. reg. Soc. Sci. Upsala III, 1, 127, (1851). Hennings P. Hedwigia **43**, 207, (1904). L  veill   M. J. H. Ann. de Sci. Nat. Bot. III, 43, (1845). Lloyd C. G. Mycol. Writ. **5**: *Xylaria* Notes II, 24, (1918); Ibid **6**, 896, (1919); Ibid **7**, 1251, (1924). Miller J. H. Monog. Univ. Puerto Rico B. **2**, 212, (1934); Bothalia, **4**, 270, (1942). Montagne J. F. C. Ann. Sci. Nat. II **13**, 348, (1840); Syll. Crypt. 204, (1856). Theissen F. Denk. Akad. Wiss. Wien Math-naturw. Klasse **83**, 67, (1927). Van der Bijl P. Trans Roy. Soc. S. Afr. **9**, 181, (1921).

sub *Hypoxyton apoense* Hennings P. Philip. Sci. **3**, C, 51, (1908); Hedwigia **47**, 259, (1908). Shear C. L. Lloydia **8**, 256, (1945).

sub *Hypoxyton nodulosum* Cooke M. C. Grevillea **11**, 130, (1883).

sub *Kretzschmaria rugosa* Earle F. S. Bull. NY Bot. Gard. **3**, 311, (1905).

sub *Xylaria scruposa* Fries

Berkeley M. J. Journ. Linn. Soc. Lond. **10**, 382, (1869). Dennis W. G. Kew Bull. **1956**, 436, (1956). Fries E. M. Nova acta reg. Soc. Sci. Upsala III **6**, 127, (1851). Lloyd C. G. Myc. Writ. **5**: *Xylaria* Notes II, 23, (1918); Ibid **7**, 1180, (1923). Miller J. H. Monog. Univ. Puerto Rico **B 2**, 219, (1934). Saccardo P. A. Sylloge Fungorum **1**, 331, (1882). Sydow H. & P. Leaf. Philip Bot. **4**, 1153, (1911). Theissen F. Ann. Mycol. **7**, 351, (1909); Denk. Akad. wiss. Wien math-naturw. klasse **83**, 66, (1927). Vi  gas A. P. Bragantia **4**, 114, (1944).

sub *Xylaria tuberiformis* Berkeley

Berkeley M. J. Flor. Nov. Zelandica (1853), quoted in other authors cited. Cooke M. C. Handbook of Australian Fungi 288, (1892). Lloyd C. G. Myc. Writ. **5**, 678, (1917). Rehm H. Leaf. Philipp. Bot. **6**, 1945, (1913); Ibid **6**, 2272, (1914). Saccardo P. A. Syll. Fung. I, 324, (1882).

Stromata gregarious, unbranched or with up to 7 branches; clavata pulvinate, clavate or cylindric, $1.8-8.5 \times 2.0-17 \times 1.2-41$ mm, with fertile apices or rarely sterile, acute apices; stipes absent so that stroma is sessile and attached by a central point only, ill-differentiated or distinct, $0.0-4.0 \times 0.0-30$ mm, smooth or irregularly uneven. The stromata, therefore embrace a wide range of form, including that assigned originally to *Penzigia* as well as the conventional *Xylaria* type. Subiculum rarely absent, smooth, dense matted, light or dull brown or purple brown; hyphae ropy, $1.5-6.0\mu$ in diameter. Ectostroma usually crustose, sometimes with loose setose hyphae as well, continuous or forming polygonal crusts, dull brown. Entostroma wrinkled, externally black and carbonaceous, internally pure or dull white, cream or dull yellow, fleshy, solid. Perithecia always several per stroma but as low as 4 per clava, immersed,

vaguely evident or with evident vertices, adjacent with vertical, diagonal or horizontal orientation, oval, $400-800 \times 600-1100\mu$; ostioles medium papillate. Asci cylindric, $185-260 \times 6-11\mu$. Spores navicular to broad crescentic, rarely gibbous, with narrow or acute ends, and spiral germ slits, sometimes also with prominent sheaths, dark brown, $6.0-12.0 \times 17.5-32.5\mu$, ave. $8.0 \times 23.7\mu$.

Material examined:

sub *Hypoxyton apoense*

Copeland 1073; Mt. Apo, Mindanas, Philippines, (1904), (NYBG).

sub *Kretzschmaria rugosa* Britton, Britton & Earle 6323, Sierra de Yabucon, Puerto Rico, (1922), (Mill.).

Britton & Cowel 337; Molyneux, St Kitts Island, (1901), (Mill.).

Anon 328; Herb. Insular Expt. Sta., Rio Piedras, Puerto Rico (Mill.).

sub *Xylaria anisopleura*

Rick 139; Porto Novo, Santa Catherina, Brazil, (1928), (NYBG). Slout in Gaillard's Plantes du Haute Orenoque 261; France, (1887), (NYBG). Rick 139; Porto Novo, Santa Catherina, Brazil, (1928), (Mill.). Wille 2034; Puerto Rico, (1915), (NYBG). Martin 670 ex Batista; Amazon forest, Brazil, (1961). Martin 1065; ex Schroeder, Turrualba, Costa Rica, (1962). Martin 1539; San Blás, Nayarit, Mexico, (1962). Martin 1784 ex Carroll 147; Puerto Viejo, Costa Rica, (1962). Martin 1785 ex Carroll 148; Dominical, Costa Rica, (1962).

sub *Xylaria scruposa*

Duss 80; on *Cereus giganteus*, Guadeloupe, (1900), (NYBG). Jaccoud in Herb OKF 63; San Pedro, Brusque, Santa Catherina State, Brazil, (1955), (Mill.). Rick 389; Porto Novo, Santa Catherina, Brazil, (1928), (NYBG). Roumeguère in Fungi gallici exsicc. 666; Vosges, France, (NYBG). Wiebke 3072; Molokai, Hawaii, (1928), (NYBG).

sub *Xylaria tuberiformis*

Heller; Kauai, Hawaii, (1895), (NYBG). Parks 22392; Tiriora, Rarotonga, Cook Islands, (1929), (NYBG).

Cultural characters:

Colonies velvety to lanose, with plumose aerial mycelium, uniform, pure white. Margin distinct, lobed; hyphae compact. Carbonization slight. Growth moderate, 3.1 mm/day at 28°C. optimum temperature.

Coremia unbranched, straight but spirally twisted, aristate or clavate, with basal dark mycelium only, glabrous, dull brown or black to ochre brown distally; sterile or fertile apically; $1.1-2.1 \times 17-50$ mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae $=2.5\mu$. Secondary mycelium ropy, $3.0-4.5\mu$ in diameter.

Conidiophores and conidia (Plate VII:7):

Conidiophores borne irregularly, $90-150 \times 3.0-6.0\mu$, axes tinted dull brown, branched dichotomously to the second degree uniformly or distally. Fertile branches narrow, partly serrate to regularly geniculate, lying freely, $21-72 \times 3.7-6.0\mu$. Conidia pleurocrogenous, sessile, clavate with narrow bases, dull or dark brown, $3.7-4.3 \times 7.5-9.3\mu$, ave. $3.9 \times 8.3\mu$.

8. *Xylaria mali* Fromme

Brooks F. T. Plant Diseases 236, (1953). Cooley J. S. J. Agric. Res. **69**, 449—456, (1944); Bot. Rev. **12**, 84 (1946). Fromme F. D. Virginia Agric. Exper. Sta. Tech. Bull. **34**, 6, (1928). Fromme F. D. & F. Schneiderhan Phytopathology **28**, 483—490, (1938). Fromme F. D. & H. E. Thomas Science II **45**, 93, (1917); Journ. Agr. Res. **10**, 163—174, (1919) sub *Xylaria hypoxylon*. Wolf F. A. & R. O. Cromwell Journ. Agr. Res. **9**, 269—276, (1917) sub *Xylaria hypoxylon*.

Stromata gregarious, unbranched or with up to 6 clavata; clavata spathulate, 4.0—4.5×4.0—9.0×9.0—41 mm with flaring sterile apices; stipes ill-differentiated, smooth, 10—11×12—13 mm. Subiculum smooth and even, dense matted, red brown, reticulate, 2.9—3.1 μ in diameter. Ectostroma crustose, continuous or in long indefinite plaques, at first white, saffron yellow, or deep orange, later dull murky brown. Entostroma wrinkled, externally black and carbonaceous, internally dull yellow and fleshy, solid. Perithecia always several per stroma, evident at the vertices, adjacent, 350—400×500—600 μ ; ostioles indistinct papillate. Asci not seen. Spores navicular to broad crescentic, with narrow ends, dark brown, 4.5—5.5×13.5—17.5 μ , ave. 5.0×15.6 μ .

Material examined:

Jackson; on *Pyrus malus*, Virginia, U.S.A., (1917), (NYBG). Martin 628; culture only ex Barnett & Stipes, Morgantown, W. Va., U.S.A., (1961). Morgan 650; Ohio, (? Date), (NYBG).

Imperfect stage:

Fromme F. D. (1920), Fromme F. D. & H. E. Thomas (1917, 1919); Wolf F. A. & R. O. Cromwell (1917), loc. cit.

Colonies velvet-felty, with fine texture, uniform, dull or pure white. Margin distinct, entire or lobed; hyphae compact. Carbonization absent to extensive. Growth rate moderate, 2.6 mm/day at 25°C.

Coremia unbranched to bifurcate, curved, spathulate, with dark basal mycelium only, initially pink, 1.0—2.4×3.0—32 mm. No conidia have been observed.

Wolf & Cromwell describe them as typical for *Xylaria*, hyaline, elongate oval, measuring about 3—3.5×10 μ . The coremia obtained by these authors were more massive in size, stout and twisted, hirsute, 4—6 cm long, grey violet or green along their length and flesh coloured at the apices.

9. *Xylaria polymorpha* (Pers.) Breville

Berkeley M. J. in Smith J. E.: English Flora **5**, (2), 234, (1836); Hooker's Journ. of Bot. **3**, 205, (1851); Journ. Linn. Soc. Lond. **10**, 379, (1869); Ibid **13**, 177, (1873); Grevillea **4**, 48, (1875); Journ. Linn. Soc. Lond. **14**, 117, (1875). Berkeley M. J. & C. E. Broome Trans. Linn. Soc. Lond. II, **1**, 405, (1879). Berkeley M. J. & M. C. Cooke Journ. Linn. Soc. Bot. **15**, 395, (1877). Bizzozero G. Flora veneta critt. **1**, 197, (1885). Brefeld O. Untersuch. aus dem Gesamtgebiete der Myk. X, Ascomycetes **2**, 262, (1862). Bresadola G. & P. A. Saccardo Malpighia **4**, 301, (1890). Cesati V. Atti. R. Accad. Scienze Fisiche e Matem. **8**,

- 16, (1879). Chardon C. E. Bol. Real. Soc. Espana Hist. Nat. **28**, 121, (1928). Cooke M. C. Handbook of British Fungi II, 789, (1871); Handbook of Australian Fungi 285, (1892). Corda A. K. J. Icones Fungorum V, 75, (1842). Currey F. Trans. Linn. Soc. Lond. **22**, 263, (1859). Dennis R. W. G. Kew Bull. **1956**, 438, (1956); British Cup Fungi, 180, (1960), sub *Xylophaera*. Ellis T. B. & B. M. Everhart Journ. Mycol. **3**, 99, (1887); N. Amer. Pyren. 665, (1892). Ferdinandsen C. & O. Winge Mykologiske Ekskursionsflora 399, (1943). Fromme F. D. Virginia Agr. Exper. Sta. Tech. Bull. **34**, 12—13, (1928). Fromme F. D. & H. E. Thomas Science II, **45**, (1917); Journ. Agr. Res. **10**, 163—174, (1919). Fuckel L. Symb. Myc. **238**, (1869—1870). Greville R. K. Flora edinensis 355, (1824); Scottish Crypt. Flor. **4**, 237, (1826). Gwynne-Vaughan H. C. I. & B. F. Barnes Structure & Development of the Fungi 269, (1937). Hawkins S. Proc. Indiana Acad. Sci. **35**, 227, (1925). Hennings P. Bot. Jahrb. **14**, 368, (1892); Hedwigia **32**, 224, (1893); Bot. Jahrb. **17**, 79, (1895); Abh. Bot. Verh. Prov. Brand. **40**, 160, (1898); Hedwigia **42**, (83), (1903); Ibid **43**, 207, (1904). Von Hohenel F. Denk. Akad. wiss. Wien math-naturw. klasse **83**, 27, (1927). Hébert E. E. Journ. Agr. Res. **29**, 523—567, (1924). Jacewski A. L. Bull. Soc. Myc. de France **11**, 132, (1895). Karsten P. A. Mycologia Fennica II, 36, (1873). Kickx T. Flora Crypt. Flandres 309, (1867). Lambotte E. Flora mycol. belge 428, (1880). Lloyd C. G. Myc. Writ. **7**, 1218, (1923); Ibid **7**, 1353, (1925). Miller J. H. Mycologia **20**, 202, (1928); Bothalia **4**, 270, (1942). Nitschke T. Pyren. Germ. **1**, 16, (1867). Quélet L. Champ. Jura et Vosges 487, (1875). Rabenhorst L. Kryptoflor. Deutsch. II, 878, (1887). Rehm H. Berichte Naturh. Ver. Augsburg **26**, 104, (1881); Hedwigia **21**, 135, (1882); Ibid **40**, 146, (1901). Saccardo P. A. Sylloge Fungorum **1**, 309, (1882); Fungi Ital. 580, (1877—1886); Ann. Mycol. **4**, 74, (1906). Spegazzini C. Aust. Soc. Scient. Arg. **18**, 277, (1884); Bol. Acad. Nac. Cienc. Cordoba **11**, 512, (1889). Stårback K. Bih. Svenska vet-akad. Handl. **27**, 21 (1901). Van der Bijl P. Trans. Roy. Soc. S. Afr. **9**, 181, (1921). Weir J. R. Phytopath. **7**, 223—224, (1917).
 sub *Sphaeria polymorpha* Persoon
 Albertini J. D. & L. D. de Schweinitz Conspectus fungorum Lusitiae **3**, (1805). Fries E. M. Syst. Mycol. **326**, (1823). Gray S. F. Natural arrangement of British Plants 512, (1821). Hooker W. J. Flora Scotica II, **4**, (1821). Junghuhn F. H. Praemissa fl. crypt. Javae **23**, (1838).

Stromata gregarious, unbranched or with up to 3 clavate; clavata clavate, pulvinate, cylindric or spatulate, $1.4\text{--}15 \times 2.2\text{--}17 \times 1.8\text{--}34$ mm with fertile or sterile apices; stipes ill-differentiated to distinct, $0.7\text{--}9.0 \times 1.0\text{--}65$ mm, smooth or longitudinally channelled. Subiculum smooth and even, dense matted, dull brown to red brown; hyphae loose to ropy or reticulate, $2.5\text{--}5.6\mu$ in diameter. Ectostroma continuous or in long indefinite plaques, dull brown. Entostroma wrinkled, black and carbonaceous externally, fleshy and pure white to dull yellow internally, solid. Perithecia always several per stroma, adjacent, vaguely evident to immersed, oval or globose, $400\text{--}800 \times 700\text{--}1000\mu$; ostioles medium or indistinct papillate. Asci cylindric, $205\text{--}265 \times 8\text{--}11\mu$; stipes $48\text{--}109\mu$. Spores navicular to crescentic, occasionally gibbous with narrow or acute ends, medium to dark brown, with short or elongate linear germ slits, $5.5\text{--}10.5 \times 20.0\text{--}29.5\mu$, ave. $7.7 \times 24.7\mu$.

Material examined:

Everhart & Haines, Westchester, Pa., U.S.A., (1883), (NYBG). Kramer in University of Kansas SC Herb. 19; Leavenworth Co., Kansas, U.S.A. (1958). Martin 629; culture only ex Barnett & Stipes, Morgantown, W. Va., U.S.A., (1961). Martin 1541; San Blas, Nayarit, Mexico, (1962). Martin 1649; Roxbury, Conn., U.S.A., (1963). Martin 1689; Conway State Forest, Mass., U.S.A., (1963). Martin 1710; Mt. Toby, Mass., U.S.A., (1963). Martin 1782, 1783 ex Carroll 144 & 145; Puerto Viejo, Costa Rica, (1962). Martin 1823 ex Kramer; Douglas Co., Kansas, U.S.A., (1954). Voss & Magnus in Rehm's Ascomyceten 427; auf Birkenstümpfen, Berlin (1886), (NYBG).

Cultural characters (Plate VI:11). See also Martin (1967), (Plate V:3):

Colonies floccose, with coarse texture, uniform, pure white. Margin distinct, entire; hyphae compact. Carbonization absent. Growth rapid, atypical for a *Xylaria*, 10.0 mm/day at 25°C.

Coremia clavate to spatulate, also straight aristate, with dark basal mycelium only, pale grey to black axes and white globose or flaring heads, 1.2—2.8 × 20—30 mm. No conidia were observed.

Microscopic characters:

Primary mycelium undiagnostic, maximum diameter of the marginal hyphae = 3.8 μ. Secondary mycelium absent.

Imperfect stage:

Brefeld O. (1891), Chardon C. E. (1928), loc. cit. Guèguen F. Bull. Soc. Myc. de Fr. 25, 89—97, (1909). Hubert E. E. Journ. Agr. Res. 29, 523—567, (1924).

Brefeld illustrates a typically irregular conidiophore with large conidia, 6—7 × 10—13 μ.

10. *Xylaria curta* Fries

Dennis R. W. G. Kew Bulletin 1956, 435, (1956). Fries E. M. Nova acta regiae soc. scient. Upsala III 1, 110, (1851). Lloyd C. G. Myc. Writ. 7, 1354, (1925).

Stromata gregarious, clavate: clavata unbranched, 3.0—7.0 × 4.5—12 × 8.0—35 mm, with fertile apices; stipes ill-differentiated or distinct, smooth, longitudinally channelled or irregularly uneven, 1.1—5.5 × 1.7—19 mm. Subiculum absent or of dense matted hyphae, dull brown; hyphae loose to ropy 2.5—3.8 μ in diameter. Ectostroma crustose, in polygonal plaques, sometimes split away from ostioles leaving ochraceous truncate discs (cf *Annulata* group of *Hypoxylon*); colour yellow ochre becoming dull murky brown to black with age. Entostroma smooth or wrinkled carbonaceous externally, flesh internally and solid to involute, cream to pure white. Perithecia always several per stroma, evident at vertices to completely immersed, adjacent, globose to oval, 500—800 × 600—800 μ; ostioles papillate, conspicuous to very small. Asci cylindric, 95—185 × 4—6 μ; stipes 23—120 μ. Spores crescentic, narrow-ended, medium brown to black, 3.0—5.0 × 8.0—12.0 μ, ave. 4.2 × 9.4 μ.

Material examined:

Fidalgo 59; Jardim Botânico do Rio de Janeiro, Guanabara, Brazil, (1957), (Mill.). Martin 653, 654 ex Batista; Amazon forest, Brazil, (1961). Martin 1777 ex Carroll 150; Puerto Viejo, Costa Rica, (1962). Rick 386; Porto Novo, Santa Catherina, Brazil, (1928), (NYBG). Welden 1124 in Tulane University Herb.; Orizaba, Mexico, (1959), (NYBG).

Cultural characters (Plate V:11; Plate VI:10):

Colonies velvety, plumose, uniform, pure white. Margin distinct, pulmose;

hyphae compact. Carbonization slight. Growth rate moderate, 2.6 mm/day at 20°C. optimum temperature.

Coremia short, unbranched, straight aristate, white, with dark basal mycelium only, fertile over the apices and sides, $0.4-0.8 \times 2.5-3.5$ mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae $=1.8\mu$. Secondary mycelium reticulate, hyphae $1.8-2.7\mu$ in diameter.

Conidiophores and conidia (Plate VII:12):

Conidiophores irregular or in palisade formation, relatively short, $26-75 \times 1.5\mu$, branched dichotomously or ternately to the first or second degree distally or over the apices only of the primary axes. Fertile branches swollen, clavate or elliptic, lying freely or in trident formation, $3.1-4.3 \times 6.2-16\mu$. Conidia acrogenous, rather thick walled, on slender sterigmata, narrow clavate, cinereous grey en masse, $2.5-3.8 \times 5.6-8.8\mu$, ave. $3.4 \times 6.9\mu$.

11. *Xylaria cornudamae* (Schw.) Berkeley

Berkeley M. J. *Grevillea* 4, 48, (1875). Ellis J. B. & B. M. Everhart *Journ. Mycol.* 3, 109, (1887); N. Amer. *Pyren.* 673, (1892). Fromme F. D. *Virginia Agr. Exper. Sta. Tech. Bull.* 34, 12—13, (1928); *Journ. Agr. Res.* 10, 163—174, (1919). Lloyd C. G. *Myc. Writ.* 7, 1250, (1924). Rick J. *Ann. Mycol.* 5, 337, (1907). Saccardo P. A. *Syll. Fung.* 1, 338, (1882). Theissen F. *Ann. Mycol.* 7, 351, (1909).
sub *Sphaeria cornudamae* Schweinitz L. v. D. *Trans. Amer. Phil. Soc. Philad.* NS 4, 189, (1832).

Stromata clavate to cylindric, unbranched to once dichotomous, usually separate but definitely gregarious; clavata $2.0-7.5 \times 3.0-8.0 \times 12-54$ mm; apices fertile or sterile and short umbonate; stipes longitudinally channelled or smooth, $1.5-5.0 \times 5.5-5.5$ mm. Subiculum dense matted, dull brown, ropy; hyphae $3.0-4.5\mu$ in diameter. Ectostroma in broad polygonal or linear crusts, white yellow ochre, fawn brown, purple brown, or dull brown. Entostroma wrinkled, carbonaceous externally, fleshy and pure white internally. Perithecia always several per stroma, vaguely evident, globose to oval, close crowded or merely adjacent, $400-700 \times 600-900$; ostioles medium papillate. Asci cylindric, $155-215 \times 6-9\mu$; stipes $66-114\mu$. Spores chiefly broad crescentic but also gibbous or navicular, with narrow, rarely broad, ends, and with spiral germ slits, dark brown to black, $5.0-8.0 \times 12.0-20.5\mu$, ave. $6.1 \times 16.3\mu$.

Material examined:

Dearness 377d; Canada (details absent), (NYBG). Godfrey; Tuckaseegee River, N.C., U.S.A., (1951), (NYBG). Martin 1708, 1709, 1711; Mt. Toby, Mass., U.S.A., (1963). Martin 1740; Conway State Forest, Mass., U.S.A., (1963). Morgan; Ohio, U.S.A., (1886), (NYBG). Thaxter in Miller 8763; on Cranberry, N.C., U.S.A., (1887), (NYBG).

Cultural characters (See Martin (1967) Plate III:6):

Colonies at first submersed, later canescent to felty, with gelatinous aspects. Aerial mycelium, pure white, appressed to plumose, strongly zonate, (rarely uniform) with up to 4 zones. Margin not distinct, entire or segmented, often plumose, hyphae compact. Carbonization absent or slight. Growth rate slow, $1.1-1.4$ mm/day at 25°C .

Coremia unbranched or dichotomous, straight, aristate to clavate, without dark mycelium and with white or brown apices, $0.3-0.9 \times 7-17$ mm; fertile over sides only.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of marginal hyphae $=1.5\mu$. Secondary mycelium loose, uniform, $2.2-3.0\mu$ in diameter.

Imperfect stage (Plate VII:10):

Fromme F. D. loc. cit.

Conidiophores produced in irregular or palisade formation, tinted olivaceous, branched to the first or second degree distally or at the apices only, with up to 4 branches arising from the same point, $70-140 \times 1.5\mu$. Fertile branches swollen, clavate or elliptic, lying freely, $3.1-6.3 \times 7.5-30\mu$. Conidia acrogenous, somewhat thickwalled, borne on narrow sterigmata, short or long clavate with narrow bases, dull brown, $2.7-3.1 \times 5.0-8.7\mu$, ave. $3.1 \times 6.8\mu$.

B. Stromata stipitate, not polymorphic; conidiophores in palisade formation only, coremia typically aristate and dark coloured.

12. *Xylaria apiculata* Cooke (Fig. I:5).

Cooke M. C. *Grevillea* **8**, 66, (1879). Dennis R. W. G. *Kew Bull* **1956**, 421, (1956). Lloyd C. G. *Mycol. Writ.* **5**, 676, (1917); *Ibid: Xylaria Notes II*, 20, (1918); *Ibid* **6**, 970, (1920); *Ibid* **7**, 1119, (1922); *Ibid* **7**, 1218, (1923). Petch T. *Ann. Roy. bot. gard. Perad.* **8**, 124, (1924). Ruehle G. D. *Phytopath.* **31**, 936-939, (1941). Spegazzini C. *Ann. mus. nac. Buenos Aires* **6**, 260, (1899). Theissen F. *Ann. Mycol.* **7**, 350, (1909); *Denk. Akad. Wiss. Wien math-naturw. klasse* **83**, 61 (1927). Van der Bijl P. *Trans. Roy. Soc. S. Afr.* **9**, 181, (1921). Viégas A. P. *Bragantia* **4**, 108, (1944).

Stromata usually gregarious, clavata pulvinate to cylindric, or coniform, with short acuminate sterile apices, $1.2-3.0 \times 1.5-2.5 \times 1.8-35$ mm; stipes distinct, short to elongate, black or dull brown, longitudinally channelled, $0.4-1.0 \times 1.5-30$ mm. Subiculum rough, dense matted to sparse setose, dull brown, ropy, hyphae $3.7-6\mu$ diam. Initial layer of clava cream; later ecto-



stroma turns yellow gold, buff, fawn or dull brown, crustose, splitting in linear crusts and often feebly persistent. Surface of stroma wrinkled or smooth; outer entostroma carbonaceous, inner fleshy, white. Perithecia 4 to several per stroma, evident at vertices to completely immersed, globose to oval, $500-1000 \times 600-1000 \mu$; ostioles medium papillate. Asci cylindric, $95-270 \times 7-13 \mu$; stipes $27-138 \mu$. Spores gibbous to navicular, narrow ended, with prominent sheaths, medium to dark brown, $5.0-10.5 \times 10.5-30.0 \mu$, ave. $7.6 \times 10.2 \mu$.

South African hosts: *Olea capensis*, *Scutia myrtina*

Material examined:

Linder 466; Bautica, British Guiana, (1923), (NYBG). Martin 295, 457; Nature's Valley, Western Cape, South Africa, (1958, 1959). Martin 525, 535, 537; Hogsback, nr Alice, E. Cape, South Africa, (1958, 1959). Martin 652 ex Chaves Batista; Amazon forest, Brazil, (1961). Martin 882-885; Arcata, Northern California, U.S.A. (1961). Rick's Fungi austro-americani 279; Sao Leopoldo, Brazil, (1907), (NYBG).

Cultural characters (Plate V:7):

Colonies of the typical *Xylaria* format: velvety with fine texture, uniform, pure white. Margin distinct, entire or lobed, hyphae compact. Carbonization extensive. Growth rate moderate, 2.6 mm/day at 25°C.

Coremia sterile, single and unbranched, straight aristate, mostly dark superficially to white apically, $1.0-2.0 \times 10-25$ mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of marginal hyphae $=2.1 \mu$. Secondary mycelium reticulate, $1.4-3.2 \mu$ in diameter, distinguished

FIGURE II. Microscopic Characters

- 1-2. Marginal hyphae
 1. *Xylaria berteri*
 2. *Kretzschmaria deusta*
- 3-5. *Kretzschmaria deusta*
 3. Vertical section through young stroma
 - Vertical dots and lines: Conidiophores and conidia (later ectostroma)
 - Solid black: Carbonaceous entostroma
 - White: Fleshy entostroma
 - Irregular lines: dark crustose mycelium
 - Horizontal lines: Wood
4. Conidiophores and conidia
5. Secondary mycelium
- 6-7. *Xylaria berteri*
 6. Conidiophores and conidia
 7. Secondary mycelium
- 8-9. *Xylaria fioriana*
 8. Conidiophores and conidia
 9. Secondary mycelium
10. *Xylaria arbuscula*: Secondary mycelium
11. *Podosordaria plumosa*: Secondary mycelium

by the production of small club-shaped side-branches, some of which swell and become carbonous (cf *Hypoxylon truncatum*).

13. *Xylaria arbuscula* Saccardo

Dennis R. W. G. Kew Bull **1956**, 420, (1956). Hennings P. Bot. Jahrb. **14**, 367, (1892); Abh. Bot. Ver. Prov. Brand. **40**, 159, (1898). Lloyd C. G. Mycol. Writ. **5**: *Xylaria* Notes II, 21, (1918). Miller J. H. Monog. Univ. Puerto Rico B **2**, 213, (1934); Bothalia **4**, 265, (1942). Rehm H. Hedwigia **40**, 147 (1901); Ann. Myc. **9**, 4, (1911). Saccardo P. A. Fungi Ital. **583**, (1877—1886); Michelia **1**, 249, (1878). Spegazzini C. An. mus. nac. Buenos Aires **6**, 260, (1899). Theissen F. Denk. akad. wiss. Wien math-naturw. klasse **83**, 61, (1927). Traverso J. B. Flora Ital. Crypt. **129**, (1906).

Stromata usually gregarious, rather narrow and filiform with abruptly pointed sterile apices; clavata elliptic to cylindric, $1.0\text{--}2.6 \times 1.0\text{--}2.6 \times 1.5\text{--}10$ mm, stipes longitudinally channelled, $0.3\text{--}1.2 \times 2.0\text{--}10$ mm. Subiculum not seen. Ectostroma not conspicuous at maturity, crustose, in linear strands, dull brown. Surface of entostroma wrinkled, black; exterior carbonaceous, interior white fleshy, solid. Perithecia 3 to several per stroma, $400\text{--}450 \times 450\text{--}550\mu$; ostioles medium papillate. Asci cylindric, $105\text{--}120 \times 6\text{--}8\mu$; stipes $40\text{--}47\mu$. Spores elliptic, navicular, narrow-ended, with prominent gelatinous sheaths, dark brown, $4.5\text{--}7.0 \times 10.5\text{--}16.0\mu$, ave. $5.4 \times 12.9\mu$.

South African hosts: Wood unidentified

Material examined:

Martin 57, 59; Nature's Valley, Knysna District, Western Cape, South Africa, (1958).

Cultural characters (Plate V:9):

Colonies typical for *Xylaria*, velvety, uniform, pure white. Margin distinct, entire or lobed, hyphae compact. Carbonization extensive. Growth rate moderate, 2.2 mm/day at 20°C optimum temperature.

Coremia sterile, single and unbranched, straight aristate, mostly dark superficially but white apically, $1.0\text{--}2.0 \times 25\text{--}30$ mm.

Microscopic characters (Fig. II:10):

Primary mycelium undiagnostic; maximum diameter of marginal hyphae $= 2.1\mu$. Secondary mycelium reticulate, dense, with club-shaped branches as in *X. apiculata*, $1.3\text{--}2.9\mu$ in diameter.

14. *Xylaria luteostroma* Lloyd

Lloyd Myc. Writ. **6**, 896, (1919); Ibid **6**, 993, (1920).

Stromata gregarious, unbranched or with up to 8 branches; clavata cylindric, narrow, $0.9\text{--}3.0 \times 1.2\text{--}5.5 \times 8.5\text{--}48$ mm; apices fertile or sterile and blunt; stipes ill-differentiated or distinct, dull brown, smooth, longitudinally channelled

or irregularly uneven, $0.8-6.0 \times 3.5-18$ mm. Subiculum sometimes absent; when present rough, dense matted, dull brown or red brown; hyphae loose to rosy, $2.2-5.0 \mu$ in diameter. Ectostroma crustose, in linear or polygonal crusts, sometimes forming truncate discs around the ostioles as in *X. hypoxylon*, dull brown to black. Entostroma smooth or wrinkled; externally black and carbonaceous, internally dull yellow and fleshy, solid or with cavities. Perithecia always several per stroma, vaguely evident in outline to immersed, adjacent to close crowded, $300-500 \times 300-600 \mu$; ostioles medium or prominent papillate. Asci cylindric, $125-130 \times 5-6 \mu$; stipes $52-60 \mu$. Spores equilateral, gibbous or navicular, with narrow or acute ends, dark brown to black, $3.5-5.5 \times 7.5-12.0 \mu$, ave. $4.8 \times 9.8 \mu$.

Material examined:

Baker's Fungi Malayana 300; Mt. Maquiling, Philippines, (1915), (NYBG). Carroll 461; Côte d'Ivoire, (1954). Kramer, in U. of Kansas Sc. Herb 7; Leavenworth, Kansas, U.S.A., (1955). Martin 1513; San Blàs, Nayarit, Mexico, (1962). Ramos 1205; Bosoboso, Rizal Luzon, Philippines, (1906), (NYBG).

Cultural characters:

Colonies silky to cottony, coarse, uniform, dull white. Margin not distinct, entire; hyphae compact. Carbonization absent. Growth slow, 2.0 mm/day. Coremia not formed; sterile.

Microscopic characters:

Primary mycelium undiagnostic, maximum diameter of the marginal hyphae $= 2.5 \mu$. Secondary mycelium loose, $3.0-3.8$ mm in diameter.

15. *Xylaria hypoxylon* (Linn. ex Fr.) Greville (Plate II:12):

Baccarini P. *Annali di Botanica* **14**, 134, (1917). Berkeley M. J. in Smith J. E. *English Flora* **5** (2), 234, (1836); *London Journ. of Bot.* **1**, 456, (1842); *Ibid* **2**, 639, (1843); J. Linn. Soc. **10**, 381, (1869); *Ibid* **13**, 177, (1873); Greville **4**, 48, (1875); J. Linn. Soc. **16**, 48, (1878). Berkeley M. J. & C. E. Broome J. Linn. Soc. **14**, 119, (1875). Berkeley M. J. & M. C. Cooke *Ibid* **15**, 395, (1877). Berlèse A. N. & G. Bresadola *Ann. Soc. Alp. Trid.* **14**, 20, (1887—1888). Bizzozero G. *Flora veneta critt.* **1**, 198, 1885. Brefeld O. *Untersuch. aus dem gesamt. der Myk. X. Ascomyceten* **2**, 264, (1891). Bresadola G. & P. A. Saccardo *Malpighia* **11**, 293, (1897). Cesati V. *Atti. R. Accad. Scienze Fisiche de Matem.* **8**, 16, (1879). Cooke M. C. *Handbook of British Fungi* 790, (1871); *Handbook of Australian Fungi* 289, (1892). Currey F. *Trans. Linn. Soc. Lond.* **22**, 264, (1859). Dennis R. W. G. *British Cup Fungi* 181, (1960) sub *Xylosphaera*. Ellis J. B. & B. M. Everhart *Journ. Mycol.* **3**, 110 (1887); N. Amer. Pyren. 672, (1892). Ferdinandsen C. & O. Winge *Mykologiske Ekskursionsflora* 400, (1943). Fuckel L. *Symb. Myc.* 238, (1869—1870). Greville R. K. *Flora edinensis* 355, (1824). Guéguen F. *Ann. Mycol.* **9**, 326—328, (1911). Gwynne-Vaughan H. C. I. & B. F. Barnes *Structure and development of the Fungi* 269, (1937). Hawkins S. *Proc. Indiana Acad. Sci.* **35**, 228, (1925). Hennings P. *Bot. Jahrb.* **14**, 367, (1892); *Bull. Herb. Boiss* **1**, 118, (1893); *Engler Bot. Jahrb.* **22**, 79, (1895); *Abh. Bot. Prov. Brand.* **40**, 159, (1898); *Hedwigia* **40**, 340, (1901). Jaczewski A. L. *Bull. Soc. Myc. de Fr.* **11**, 133, (1895). Junghuhn F. H. *Praemissa Flora Crypt. Javae* **22**, (1838). Karsten P. A. *Mycologia Fennica II. Pyrenomyces* 34, (1873). Kickx J. *Flora crypt. Flandres* 310, (1867). Lambotte E. *Flora mycol. belge* 429, (1880). Lindau G. in *Engler & Prantl: Die natürlichen Pflanzenfamilien* **1**, 488, (1897).

Lloyd C. G. Mycol. Writ. **7**, 1119, (1922). Miller J. H. Jour. Dept. Agric. Puerto Rico **14**, 275, (1930); Monog. Univ. Puerto Rico B **2**, 216, (1934); Bothalia **4**, 267, (1942). Montagne J. F. C. in Gay: Hist. Cuba VII 430, (1850). Murrill W. A. Mycologia **7**, 131—133, (1915). Nitzschke T. Pyren. Germanici: **1**, 5, (1867). Rabenhorst L. Krypt. Flor. Deutsch II, 872, (1887). Rehm H. Hedwigia **24**, 234, (1885). Saccardo P. A. Fungi Ital. 582, (1877—1886). Syll. Fung. **1**, 333, (1882); Ibid **24**, 1099, (1930). Schröter J. in Cohn: Krypt. Flor. Schlesien 467, (1908). Spegazzini C. Bol. Acad. Nac. Cienc. Cordoba **11**, 511, (1889). Starbäck K. Bih. Svenska Vet. akad. Handl. **15**, 8, (1889). Sydow H. & F. Petrak Ann. Mycol. **20**, 186, (1926). Sydow H. & P., & E. J. Butler Ibid **9**, 418, (1911). Theissen F. Denk. Akad. wiss. Wien math-naturw. klasse **83**, 54, (1927). Traverso J. B. Flora Ital. Crypt. **1**, 28 (1906). Willdenow C. L. Florae Berolinensis Prodrum **406**, (1787).

sub *Clavaria*

Linnaeus C. Flora Suecica II, 457, (1755).

sub *Sphaeria hypoxylon* Linn. ex Fr.

Albertini J. B. & L. D. de Schweinitz Conspectus fung. Lusitiae **2**, (1805). Fries E. M. Syst. Mycol. **327**, (1823). Hooker W. J. Flora Scotica II, 4, (1821). Persoon C. H. Obs. Mycol. **20**, (1796); Comment Fung. Clavae **81**, 146, (1797); Syn. meth. fung. **5**, (1801—1808).

sub *Xylaria cristulata* Lloyd C. G. Mycol. Writ. **5**; *Xylaria* Notes II, 31, (1918).

sub *Xylaria subtrachelina* Hennings

Ferdinandson C. & O. Winge Bot. Tidskrift **29**, 18, (1909). Hennings P. Hedwigia **43**, 207, (1904). Lloyd C. G. Mycol. Writ. **7**, 1121, (1922).

Stromata usually gregarious, with 1—8 clavata, linear to spatulate, occasionally short; clavata spatulate, cylindric, or pulvinate, 1·0—3·0 × 1·5—5·5 × 2·0—43 mm, with flattened sterile apices; stipes often absent, longitudinally channelled, 0·4—3·0 × 0·7—56 mm. Subiculum dull brown or purple brown, ropy, 1·8—5·6 μ in diameter. Ectostroma initially white, later fawn brown to black, persistent, nearly continuous or in linear crusts, smooth or uneven. Entostroma carbonaceous externally, white internally to pale grey. Perithecia 7 to many per stroma, evident or vaguely evident to immersed, 400—750 × 500—800; ostioles small or medium papillate, often in the centre of small truncate discs, sometimes barely perceptible. Asci cylindric, 80—190 × 4—8 μ ; stipes 32—90 μ . Spores gibbous, navicular or crescentic, narrow-ended, medium to dark brown, sometimes with visible gelatinous sheaths, 4·0—7·5 × 8·5—15·0 μ , ave. 5·2 × 11·2 μ .

Material examined:

Bärland; Karislojo, Sweden, (1950), (Hel). Ellis; on *Quercus*, Newfield, N.J., U.S.A., (1875), (NYBG). Enkams; Espoo, Nylandia, Sweden (1943), (Hel). Fleming; Arima Valley, Trinidad, (1960), (NYBG). Hisinger; Pojo, Brodorp, Sweden, (1882), (Hel). Malmstrom; Helsingfors, Aggelby, Sweden, (1932), (Hel). Martin 659, 682, 686—688; Yosemite, California, U.S.A., (1961). Martin 732—737; Klamath, N. California, U.S.A., (1961). Martin 781; O'Brien, N. California, U.S.A., (1961). Martin 794, 818, 866, 877—881; Arcata, N. California, U.S.A., (1961). Martin 927; Mazatlán, Sinaloa, Mexico, (1961). Martin 1515, 1540; San Blas, Nayarit, Mexico, (1961). Martin 1738; Conway State Forest, Mass., U.S.A., (1961). Martin 1786, ex Carroll 163; Sor, Denmark, (1962). Martin 1787 ex Carroll 164; Gentofte, Denmark, (1962). Martin 1802 ex Carroll 457; Hareskov, Copenhagen, Denmark, (1963). Martin 1821 ex Kramer; Riley Co., Kansas, U.S.A., (1963). Martin 1828 ex Kramer in U. of Kansas SC. 15; Cofferville, Labette Co., Kansas, U.S.A., (1963). Thaxter in Miller 8832; Waverly, Mass., U.S.A., (1892), (NYBG). sub *Xylaria cristata* Rick, Fungi austro-amer. 281; Sao Leopoldo, Brazil, (1907), (NYBG). sub *Xylaria subtrachelina* Rick, Fungi austro-amer. 238; San Leopoldo, Brazil, (1905), (NYBG).

Imperfect Stage (Plate V:8, Plate VI:1):

Brefeld O. loc. cit. Cornu M. Ann. Sci. Nat. bot. **6**, 85—86, (1876). Freeman D. L. Ann. Mycol. **8**, 192—211, (1911). Guéguen F. Comptes rendus hebdomadaires des séances de l'Académie des sciences et belles-lettres. **61**, 316—317, (1906); Bull. Soc. Myc. de Fr. **23**, 186—217, (1907). Harder R. Naturw. Zeit. Forst. u. landw. **7**, 429—436, 441—476, (1909). Jaczewski A. L. loc. cit. Lindau G. loc. cit. Traverso J. B. loc. cit.

Colonies velvet felty, with fine or smooth surface, uniform on strongly zonate, pure white, sometimes with yellow discolouration. Margin distinct or not distinct, entire or lobed. Carbonization absent, slight or extensive. Growth rate very slow to moderate, 0.3—2.3 mm/day at 25°C. Coremia often absent; when present unbranched, or with up to 6 branches, straight, aristate or fan-shaped, dark at the base only, with ochraceous apices and the rest white or greyish, 0.3—1.8 × 1.5—44 mm. No conidia observed. Conidial dimensions given in the literature are rather large, reported as 2—3 × 13—15 μ (Brefeld) and 3—4 × 10—15 μ, occasionally up to 25 μ (Guéguen).

Microscopic characters:

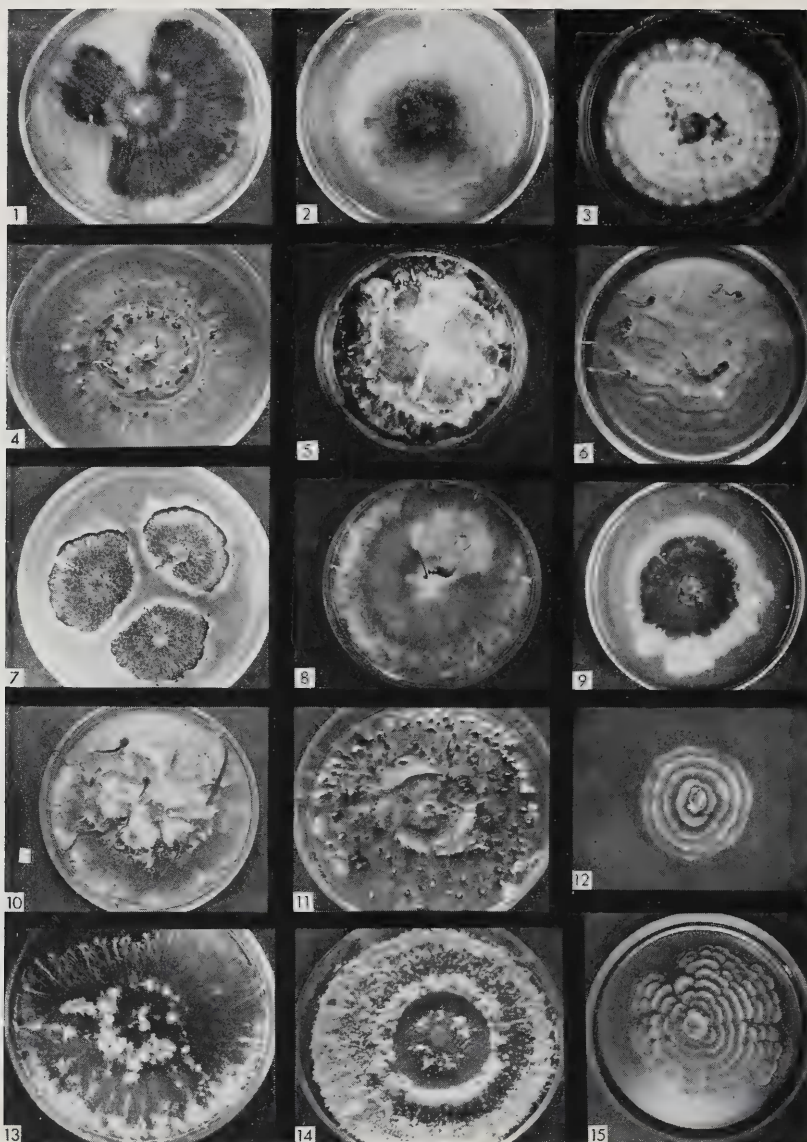
Primary mycelium undiagnostic, maximum diameter of the marginal hyphae = 2.3 μ. Secondary mycelium loose or densely reticulate, uniform or vesiculate, 2.2—4.7 μ in diameter.

16. *Xylaria digitata* (Bruck.) Greville

Berkeley M. J. in Smith J. E.; English Flora **5**, (2), 234, 1836; Ann. & Mag. Nat. Hist. **3**, 397, (1839); Journ. Linn. Soc. **10**, 379, (1869); Grevillea **4**, 48, (1875). Berkeley M. J. & C. E. Broome Journ. Linn. Soc. **14**, 117, (1875). Berkeley M. J. & M. C. Cooke Ibid **15**, 395, (1877). Bizzozero G. Flora veneta critt. **1**, 198, (1885). Cooke M. C. Handbook of British Fungi **789**, (1871). Ann. NY Acad. Sci. **1**, 184, (1878); Handbook of Australian Fungi **288**, (1892). Currey F. Trans. Linn. Soc. Lond. **22**, 263, (1859). Dennis R. W. G. Kew Bull. **1956**, 412, (1956) sub *Xylosphaera*. Ellis J. B. & B. M. Everhart Journ. Mycol. **3**, 101, (1887); N. Amer. Pyren. **669**, (1892). Fuckel L. Symbolae Mycologicae Nachtrag II, 43, (1873). Gray S. F. Natural arrangement of British Plants I, 513, (1821), sub *Hypoxylon*. Greville R. K. Flora edinensis **355**, (1824). Hennings P. C. Engler Bot. Jahrb. **14**, 368, (1892); Ibid **17**, 79, (1895); Hedwigia **40**, 341, (1901). Jaczewski A. L. Bull. Soc. Myc. de Fr. **11**, 136, (1895). Kickx J. Flora crypt. Louvain **117**, (1835); Flora crypt. Flandres **310**, (1867). Lloyd C. G. Myc. Writ. **4**; Letter **60**, 3, (1915); Myc. Writ. **6**, 976, (1920). Massee G. Kew Bull. **1898**, 129, (1898). Miller J. H. Bothalia **4**, 271, (1942). Nitschke T. Pyren. Germ. **1**, 9, (1867). Petch T. Ann. Roy. bot. gard. Perad. **8**, 120, (1924); Naturalist **1939**, 157, (1939). Quélet L. Champ. Jura et Vosges **487**, (1875). Rabenhorst G. L. Deutsch. Krypt. flor **1**, 223, (1844). Rabenhorst L. Krypt. flor. Deutsch II, 876, (1877). Schröter J. in Cohn: Kryptoflor. Schlesien **468**, (1908). Spegazzini C. Anal. Soc. scient. Arg. **18**, 278, (1884). Traverso J. B. Flora Ital. Crypt. **1**, 25, (1906). Weir J. R. Phytopath. **7**, 223—224, (1917). sub *Sphaeria digitata*

Bolton J. History of Fungusses III, 129, (1780). Bruckmann F. E. Epistola de fungo hypoxylon digitato: Helmstadt, (1725). Fries E. M. Syst. Mycol. **326**, (1823); Elenchus Fungorum II, 56, (1828). Junghuhn F. H. Praemissa fl. crypt. Javae **22**, (1838). Persoon C. H. Comment Fung. Clavae, 75, 127, (1797); Syn meth. Fung. **6**, (1801—1808). Schrank F. Baierische Flora II, 567, (1789); Ibid III, 351, (1793). Scopoli J. A. Flora carnolica **484**, (1772).

Stromata gregarious, spatulate to cylindric, divided into 3—7 clavata; clavata 1.5—2.0 × 1.5—6.5 × 5.5—16 mm, with sterile flaring spatulate



apices, stipes longitudinally channelled, black, $0.9-3.0 \times 3.0 \times 3.0-11$ mm. Subiculum dull brown, smooth or rough, ropy, $2.5-3.7 \mu$ in diameter. Ectostroma initially white, later sepia to dull brown, splitting in linear crusts, rugose or verrucose. Entostroma carbonaceous outwardly, interior white fleshy. Perithecia always several per stroma, evident at the vertices or only vaguely evident, globose, $300-400 \times 300-400 \mu$ diam.; ostioles small papillate. Asci cylindric, $90-120 \times 6-7 \mu$; stipes $25-43 \mu$. Spores elliptic, equilateral or gibbous with narrow ends, dark brown to black, $4.0-7.0 \times 8.5-14.0 \mu$, ave. $5.6 \times 11.6 \mu$.

Material examined:

Kramer in U. of Kansas SC Herb 23; Cherokee Co., Kansas, U.S.A., (1958). Martin 632 ex Plunkett; Mt Palomar, California, U.S.A., (1961). Martin 887; culture ex CBS, Baarn, Holland, (1961). Smith & McClintock 22151 in Herb NYBG R 3790; on *Umbellularia californica*, Muir Woods, California, U.S.A., (1957), (NYBG).

Cultural characters (Plate VI:8):

Colonies velvet to velvet-felty, with fine texture, uniform or with 1 or 2 zones, pure white. Margin distinct, entire or lobed, hyphae compact. Carbonization slight. Growth rate moderate, 2.7 mm/day at 25°C .

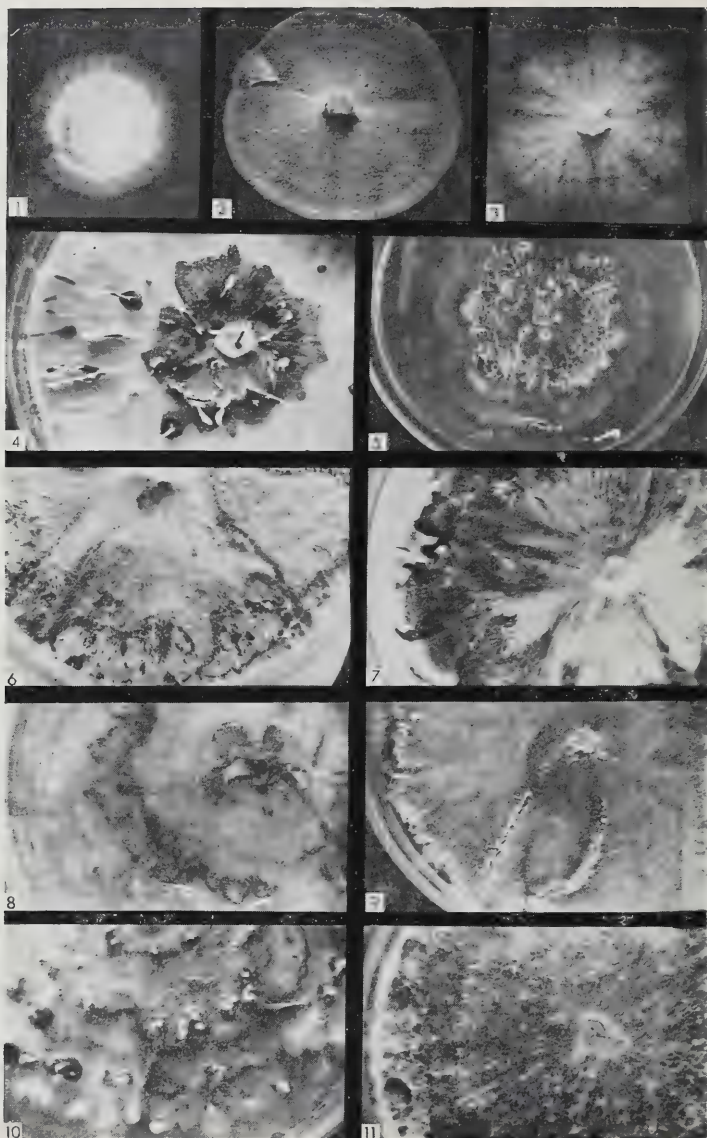
Conidiophores and conidia:

Coremia unbranched, straight aristate, mostly dark superficially but with white apices, $0.3-1.1 \times 15-58$ mm. Conidiophores irregularly developed, giving a granulate appearance, $60-460 \times 1.5 \mu$, indefinitely branched, dichotomously or ternately, over the upper parts or apices. Fertile branches smooth, slightly swollen distally, $6.0-15 \times 1.5 \mu$. Conidia acrogenous, on narrow sterigmata, narrow elongate pyriform, white, $0.6-0.9 \times 3.7-5.0 \mu$, ave. $0.7 \times 4.3 \mu$.

This species is doubtfully distinct from *X. hypoxylon*, differing in greater degree of branching of the stroma, and in rapid production of conidia in culture.

PLATE V. Cultural Characters (*Cont.*). All on malt agar, 2 weeks at 25°C .

- 1, 2. *Kretzschmaria heliscus*
3. *Kretzschmaria deusta*
4. *Xylaria enteroleuca*
5. *Xylaria berteri*
6. *Xylaria fioriana*
7. *Xylaria apiculata*
8. *Xylaria hypoxylon*
9. *Xylaria arbuscula*
10. *Xylaria castorea*
11. *Xylaria curta*
- 12, 15. *Podosordaria plumosa* 2 and 4 weeks old
13. *Xylaria appendiculata*
14. *Xylaria cubensis*



17. *Xylaria multiplex* (Kze, ex Fr.) Berkeley & Curtis

Berkeley M. J. Journ. Linn. Soc. **10**, 381, (1869). Currey F. Trans. Linn. Soc. Lond. **22**, 264, (1859). Dennis R. W. G. Kew Bull. **1956**, 417—418, (1956). Ellis J. B. & B. M. Everhart Journ. Mycol. **3**, 100, (1887); N. Amer. Pyren. 668, (1892). Hennings P. Bot. Jahrb. **17**, 7, (1893). Léveillé M. J. H. Ann. Sci. Nat. Bot. III, **3**, 42, (1845). Lloyd C. G. Myc. Writ. **5**: *Xylaria* Notes II, 25, (1918); Myc. Writ. **6**, 970, (1920). Miller J. H. Monog. Univ. Puerto Rico B **2**, 217, (1934); Bothalia **4**, 266, (1942). Montagne J. F. C. in Gay: Hist. Chile VII, 431, (1850). Petch T. Ann. Roy. bot. gard. Perad **8**, 126, (1924). Theissen F. Denk. Akad. wiss. Wien math-naturw. klasse **83**, 68, (1927). Viégas A. P. Bragantia **4**, 112, (1944). sub *Sphaeria multiplex* Kze. x Fr. Fries E. M. Linnaea **5**, 536, (1830); Nova acta reg. Soc. Scient. Upsala III **1**, 111, (1851).

Stromata gregarious, linear, cylindric or spatulate with up to 2 clavata; clavata $0.8-3.0 \times 1.0-4.5 \times 2.1-39$ mm with short grey to black sterile apices; stipes smooth or longitudinally channelled, $0.3-2.5 \times 8-16$ mm. Subiculum smooth, dense matted, dull brown or purple brown, ropy hyphae $3.0-4.5\mu$ in diameter; sometimes absent. Ectostroma persistent, crustose, in linear crusts, smooth, dull brown to black. Outer entostroma carbonaceous, inner fleshy, white, solid or with cavities. Perithecia vaguely evident to immersed, globose to oval, $350-700 \times 500-700\mu$; ostioles medium papillate to invisible. Asci cylindric, $95-115 \times 5-6\mu$; stipes $30-50\mu$. Spores gibbous to navicular, narrow-ended, dark brown to black, sometimes with prominent sheaths, $3.5-5.0 \times 8.5-12.5\mu$, ave. $4.6 \times 10.6\mu$.

Material examined:

Lyon in Sydow's Fungi Exotici exsiccati 990; on *Aleurites moluccana*, Oahu, Hawaii, (1913), sub *X. hypoxylon* forma *tropica*, (NYBG). Maguire 24681 F; Tafelberg, Surinam, (1944), (NYBG). Martin 643 ex Lowy; Baton Rouge, La., U.S.A., (1961). Martin 1550; San Blas, Nayarit, Mexico, (1961). Seaver and Chardon 177 in NYBG West Indies Explor. 512; Puerto Rico, (1923), (NYBG). sub *Xylaria constricta* ex Herb. Massee; Dominica, (pre 1909), (NYBG). sub *Xylaria cylindrica* Smith; Castillo Ometepe, Nicaragua, (1893), (NYBG).

Cultural characters (Plate IV:6; Plate VI:6):

Colonies velvet-felty, fine in texture, uniform, pure white or discoloured

PLATE VI. Surface characters of Colonies. All on malt agar, 2 weeks at 25°C unless otherwise stated

1. *Xylaria hypoxylon*: Young colony 4 days old showing white velvet habit characteristic of most *Xylaria* spp.
2. *Poronia punctata*
3. *Podosordaria hippotrichioides*
4. *Xylaria enteroleuca*
5. *Xylaria ianthino*—velutina
6. *Xylaria multiplex*
7. *Xylaria feejeensis*
8. *Xylaria digitata*
9. *Xylaria longipes*
10. *Xylaria curta*
11. *Xylaria polymorpha*

yellow. Margin distinct, entire; hyphae compact. Carbonization slight. Growth moderate, 3·7 mm/day at 25°C.

Coremia unbranched or forked, straight aristate, fan-shaped or spatulate, with setose bases, mostly dark superficially, smoky to glaucous except for white apices and yellow "collarettes", 0·5—2·5 × 15—50 mm. No conidia observed.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of marginal hyphae = 1·5 μ . Secondary mycelium densely reticulate, uniform, 3·7—4·3 μ in diameter.

18. *Xylaria feejeensis* Berkeley

Berkeley M. J. London Journal of Botany 1, 456, (1842). Dennis R. W. G. Kew Bull. 1956, 433, (1956). Lloyd C. G. Myc. Writ. 7, 1253, (1924).

Stromata gregarious, unbranched; clavata cylindric, 1·2—1·7 × 1·8—2·0 × 4·5—15 mm, with fertile apices; stipes distinct, smooth, 0·8—1·5 × 12—17 mm. Subiculum smooth, dull brown; hyphae ropy, 1·8—2·5 μ in diameter. Ectostroma in elongate crustose plaques, dull murky brown; entostroma smooth, black and carbonaceous externally, internally pure white and fleshy, solid. Perithecia always several per stroma, with evident vertices or only vaguely evident, adjacent, oval, 300—350 × 350—400 μ ; ostioles prominent papillate. Asci cylindric, 95—120 × 4—5 μ ; stipes 45—54 μ . Spores oval to elliptic, gibbous, with narrow ends, dark brown to black, 4·5—5·0 × 8·5—9·5 μ , ave. 4·5 × 9·1 μ .

Material examined:

Martin 1776 ex Carroll 152; Dominical, Costa Rica, (1962).

Cultural characters (Plate VI:7):

Colonies velvet-felty, with fine texture, zonate with 1 or 2 zones, pure white. Margin distinct, segmented, hyphae compact. Carbonization slight to extensive. Growth moderate, 2·3 mm/day at 28°C optimum temperature.

Coremia unbranched, sessile, or stipitate and straight aristate, with dark basal mycelium only, white, fertile over apices and sides, 0·5—0·9 × 2·5—4·0 μ .

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of marginal hyphae = 2·2 μ . Secondary mycelium uniform, loose or closely reticulate, but sparingly branched, 1·5—3·7 μ in diameter.

Conidiophores and conidia (Plate VII:13):

Conidiophores irregular, produced off the ordinary colony surface or from the coremia, rather short, 51—70 × 1·2—1·8 μ ; branched to the first degree

proximally or distally, 2 or 3 fertile branches arising at a node. Fertile branches swollen, clavate or elliptic, lying freely or in trident formation, $7.5-14 \times 2.5-4.3 \mu$. Conidia acrogenous, on slender sterigmata, somewhat thick walled, clavate with narrow bases, cineraceous en masse, $3.1-3.7 \times 6.2-7.5 \mu$, ave. $3.5-7.1 \mu$.

19. *Xylaria gracillima* Fries

Fries E. M. *Linnaea* 5, 538, (1830). Hennings P. *Hedwigia* 43, 207, (1904). Lévillé M. J. H. *Ann. Sci. Nat. Bot.* III, 3, 42, (1845) sub *Sphaeria*.

Stromata separate or gregarious, unbranched; clavata narrow cylindric, $0.8-1.5 \times 1.0-1.8 \times 8.0-13.5$ mm with fertile or sterile blunt apices; stipes distinct, smooth or longitudinally channelled, $0.4-0.8 \times 10-21$ mm. Subiculum rough matted, dense to sparsely setose, dull brown; hyphae ropy, $2.5-6.7 \mu$ in diameter. Ectostroma only feebly persistent, in linear crusts, fawn brown. Entostroma wrinkled or folded, black and carbonaceous externally, internally pure white and fleshy, solid. Perithecia always several per stroma, completely evident to vaguely evident, well apart to adjacent, globose, $400-700 \times 400-700 \mu$; ostioles medium papillate. Asci not seen. Spores elliptic, gibbous, navicular or broad crescentic, with narrow distal ends and truncate proximal ends, each bearing a broad obtuse appendage, dark brown to black, $5.0-5.5 \times 11.0-14.5 \mu$, ave. $5.2 \times 11.8 \mu$.

Material examined:

Martin 926, 1514; San Blás, Nayarit, Mexico, (1961, 1962).

Cultural characters:

Colonies velvety, with fine texture, uniform, pure white. Margin distinct, entire; hyphae compact. Carbonization extensive. Growth rate moderate, 2.8 mm/day at 25°C.

Coremia unbranched, straight aristate, with dark basal mycelium only, grey to white, fertile over the sides leaving the apices sterile, $0.2-0.8 \times 13-41$ mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae $= 2.7 \mu$. Secondary mycelium uniform, loose, $3.7-4.5 \mu$ in diameter.

Conidiophores and conidia (Plate VII:3, 4):

Conidiophores in palisade formation, very short, $18-25 \times 1.2 \mu$, branched quadrately to the first or second degree near the apices. Fertile branches narrow, lying freely, $4.3-13 \times 1.5-1.8$ mm. Conidia acrogenous, off slender sterigmata,

long pyriform with narrow distal ends, pale grey en masse, $0.6-0.9 \times 3.7-4.3\mu$, ave. $0.8 \times 3.9\mu$.

20. *Xylaria longipes* Nitschke

Bresadola G. & P. A. Saccardo *Malpighia* **11**, 293, (1897). Dennis R. W. G. Kew Bull. **1956**, 436, (1956). Fuckel L. *Symbolae Mycologicae* 238, (1869-1870). Hennings P. Abh. Bot. Ver. Prov. Brand. **40**, 160, (1898). Lloyd C. G. Myc. Writ. **6**, 995, (1920); *Ibid* **7**, 1247, (1924). Miller J. H. Monog. Univ. Puerto Rico B **2**, 217, (1934). Nitschke T. Pyren. Germ **1**, 14, (1867). Petch T. Naturalist **1939**, 157, (1939). Rabenhorst G. L. Krypt. flor. Deutsch II, 877, (1887). Rehm H. *Hedwigia* **21**, 135, (1882). Schröter T. in Cohn: Kryptflor. Schlesien 469, (1908). Traverso J. B. *Flora Ital Crypt.* **1**, 23, (1906).

Stromata gregarious, unbranched; clavata clavate to cylindric, $1.6-8.0 \times 4.5-11 \times 10-46$ mm, with fertile apices; stipes distinct, longitudinally channelled or irregularly uneven, $2.1-4.0 \times 9.0-41\mu$. Subiculum smooth and even, dense matted, purple-brown; hyphae ropy, $2.2-5.6\mu$ in diameter. Ectostroma in polygonal or linear crusts, fawn brown to black. Entostroma wrinkled, black and carbonaceous externally, internally fleshy, cream or white, solid. Perithecia always several per stroma, immersed, adjacent, oval, $400-500 \times 600-700\mu$; ostioles medium papillate. Asci cylindric, $110-175 \times 6-12\mu$; stipes $45-90\mu$. Spores navicular to broad crescentic, with narrow ends, spiral germ slits, and sometimes prominent sheaths, dark brown, $5.0-6.5 \times 10.5-15.0\mu$; ave. $5.7 \times 12.5\mu$.

Material examined:

Martin 676; culture only ex CBS, Baarn, Holland, (1961). Martin 904; ex Hennébert, Ottawa, Canada, (1961). Martin 1817 ex Carroll 162; Seeland, Denmark, (1962). Schnabl in Allescher & Schnabl's *Fungi Bavarici* 633; on *Acer pseudoplatanus*, Munich, Germany, (1898), (NYBG).

Cultural characters (Plate VI:9):

Colonies felty to floccose, with fine texture, uniform, pure white. Margin distinct, lobed; hyphae compact. Carbonization absent. Growth rate moderate, 3.0 mm/day at 25°C .

Coremia unbranched to furcate, straight, aristate to clavate, mostly dark superficially, initially pink, fertile over the sides leaving the apices sterile $0.8-2.5 \times 1.8-8.0$ mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of marginal hyphae $=1.5\mu$. Secondary mycelium uniform, loose, $1.8-4.3\mu$ in diameter.

Conidiophores and conidia (Plate VII:11):

Conidiophores produced irregularly, rather short, $67-112 \times 1.2\mu$, branched dichotomously to the first degree apically. Fertile branches lying freely, swollen

clavate, $7.5-16 \times 2.7-4.3 \mu$. Conidia acrogenous, sessile, somewhat thick-walled, clavate with narrow bases, cineraceous grey, $2.5-3.7 \times 5.0-6.3 \mu$, ave. $3.1-5.8 \mu$.

21. *Xylaria castorea* Berkeley (Plate II:14)

Cooke M. C. Handbook of Australian Fungi 286, (1892). Cooke M. C. & J. B. Ellis Grevillea 6, 92, (1878). Ellis J. B. & B. M. Everhart Journ. Mycol. 3, 112, (1887); N. Amer. Pyren. 666, (1892). Hawkins S. Proc. Indiana Acad. Sci. 35, 227, (1925). Lloyd C. G. Myc. Writ. 5: *Xylaria* Notes II, 17, (1918); Ibid 7, 1252, (1924). Miller J. H. Bothalia 4, 269, (1942). Van der Bijl P. Trans. Roy. Soc. S. Afr. 11, 207, (1924).

Stromata solitary, clavate, characteristically short, clavata $5.0-14 \times 5.5-18 \times 15-55$ mm, unbranched with short sterile, often pannose, bases $2.7-8 \times 4-35$ mm. Subiculum dense matted, pulvinate, purple brown; hyphae rosy, uniform, $3.0-4.5 \mu$ diameter. Ectostroma rugose or smooth, forming small polygonal plaques but not conspicuously broken up, chestnut brown to black with age. Entostroma smooth or cast into small folds or wrinkles, carbonaceous externally, pure white internally. Perithecia always several per stroma, immersed, globose to oval, $350-500 \times 500-600 \mu$; ostioles medium papillate. Asci cylindrical, $70-130 \times 4.6 \mu$; stipes $33-73 \mu$. Spores oval, gibbous, broad-ended, dark brown, with prominent gelatinous sheaths, $4.0-6.0 \times 7.0-10.5 \mu$, ave. $4.5 \times 9.1 \mu$.

South African hosts: wood, unidentifiable

Material examined:

sub *Xylaria castorea*

Davidson 634; on *Fagus grandifolia*, Eden Lake, N. S., Canada, (FBLBC) Martin 56, 214, 456; Nature's Valley, Knysna District, Western Cape, South Africa, (1958, 1959). Massee; New Zealand, (details absent), (NYBG). Rick 82; Sao Leopoldo, Brazil, (1905), (NYBG). Rick 893; in Miller 8740 Porto Novo, Brazil, (date), (NYBG). White; Bar Harbour, Maine, U.S.A., (1901).

sub *Xylaria leprosa*

Rick; Sao Leopoldo, Rio Grande do Sul, Brazil, (1932), (NYBG).

Cultural characters (Plate IB:4; Plate V:10):

Colonies velvety, fine in texture, uniform, pure white. Margin distinct, entire or lobed, hyphae compact. Carbonization extensive. Growth moderate, 1.2 mm/day at 25°C .

Coremia unbranched, straight aristate, mostly dark superficially except for white apices, $3-4 \times 50-70$ mm. No conidia observed.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae $= 2.0 \mu$. Secondary mycelium uniform, reticulate, $1.7-2.3 \mu$ in diameter.

10. *Xylaria leprosa* Spegazzini (Plate II:13; Fig. I:2).

Saccardo P. A. Sylloge Fungorum 9, 533, (1891). Spegazzini C. Bol. Acad. Nac. Cienc. Cordoba 11, 515, (1889); Anal. mus. nac. Buenos Aires 6, 262, (1899). Theissen F. Denk. Akad. wiss. Wien math-naturw. klasse 83, 63, (1927). Viégas A. P. Bragantia 4, 111, (1944).

Stromata aggregated; clavata unbranched, clavate to cylindric, $1.5-9.0 \times 1.6-11 \times 16-85$ mm, with short sterile apices; stipes distinct, longitudinally channelled, $0.6-5.0 \times 8.0-52$ mm. Subiculum rough, dense matted, dull brown; hyphae ropy, $1.8-4.3\mu$ in diameter. Ectostroma tomentose to crustose, continuous, dull brown. Entostroma wrinkled, black and carbonaceous externally, internally white and fleshy, solid. Perithecia always several per stroma, immersed, adjacent, oval, $300-400 \times 500-600\mu$; ostioles medium papillate. Asci cylindric, $145-180 \times 6-10\mu$; stipes $67-83\mu$. Spores elliptic, navicular, with broad ends, prominent gelatinous sheaths and spiral germ slits, dark brown, $5.0-7.5 \times 13.5-22.5\mu$, ave. $5.8 \times 17.3\mu$.

South African hosts: *Olea capensis*

Material examined:

Martin 65, 66, 133, 455, 497, 507; Nature's Valley, Knysna District, Western Cape, South Africa (1958, 1959).

Cultural characters (Plate IV:5):

Colonies velvety, with fine texture, uniform, pure white. Margin distinct, lobed; hyphae compact. Carbonization extensive. Growth rate moderate, 2.5 mm/day at 25°C.

Coremia unbranched, straight aristate, spirally twisted or crooked, mostly dark superficially but with white apices, densely shaggy, $3.0-4.0 \times 50-70$ mm, with conidia sometimes produced over the apices.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae $= 2.1\mu$. Secondary mycelium reticulate, uniform, close anastomosed, $1.3-2.5\mu$ in diameter.

Conidiophores and conidia:

Conidiophores produced in palisade formation, short, $50-100 \times 2.5-3.1\mu$; branched dichotomously to the second degree, throughout or distally. Fertile branches lying freely, narrow, $40-60 \times 2.0-3.0\mu$. Conidia acrogenous, off slender sterigmata, oval, pale grey en masse, $3.0-4.5 \times 4.5-8.3\mu$, ave. $3.5-6.6\mu$.

In the species described above, coremia have been observed by the writer and by other authors. Material corresponding to *X. grammica* however yielded a fine velvet colony without carbonization and without coremia, showing that all species of *Xylaria* do not necessarily give rise to the characteristic colony pattern.

Poronia & Podosordaria

In the remaining two genera the stroma differs significantly in the nature of the outermost layers. In the true species of *Xylaria* and *Kretzschmaria* the ectostroma is the outer layer and the carbonaceous layer of the entostroma lies beneath. In *Podosordaria* Ellis & Holway (1897) and in *Poronia* Willdenow (1787) there is no carbonaceous material, and in *Podosordaria* no ectostroma either so that the entostroma becomes the surface of the stroma.

In *Poronia punctata* the cupulate or discoid form of the clavata, the vertical perithecia, and the distinct white ectostroma are probably sufficient for generic distinction. (See Plate III:5). In *P. oedipus* since the stroma is concolorous it is hard to say whether the surface layer is the ectostroma or not. Since the surface around the ostioles is cracked irregularly, however, and the smooth ostioles of other species are united with the ectostroma, the writer takes the view that there is a rudimentary ectostroma present. It is not possible for the writer at present to delimit the other species of *Poronia* because insufficient material has been examined.

Poronia Willdenow, C. L. Florae Berolinensis Prodomus. Berolini, Impensis Wilhelmi Yiewegii, (1787).

The genus was originally based on *P. gleditschii* Willdenow, and *Poronia* was subsequently adopted by Fries, who changed the specific name to *P. punctata*. Subsequently Cooke (1884), Corda (1837—1842), Dawson (1900), Hansen (1876) and Lloyd (1920) have expanded and further defined the generic concept. Other species of *Poronia* include *P. agariciformis*, Lloyd, *P. arenaria* Syd. & Butler, *P. caelata* Pat., *P. chardoniana* Toro, *P. cupularis* Lloyd, *P. ehrenbergii* Henn., *P. formicata* Moll., *P. gigantea* Sacc., *P. heliscus* Mont., *P. hemisphaerica* Starbäck, *P. hypoxyloides* Rehm., *P. indica* Ahmad, *P. minuta* Petch, *P. oedipus* Mont., *P. pileiformis* (Berk.) Fr., *P. pocula* Lloyd, *P. polyporoides* Henni., *P. scutellata* Fr., and *P. turbinata* E. & E. The taxonomic position of these, with the exception of *P. oedipus* is uncertain. *Poronia doumetii* Pat., *P. kurziana* (Curr.) Lloyd, *P. leporina* E. & E., *P. macrorhiza* Speg. and *P. ustorum* Pat. are transferred by the writer here to *Podosordaria*.

Key

- 1 Ectostroma white, continuous or cracked; clavata variable in form from urceolate to oval applanate with convex to concave surface; spores equilateral, broad-ended, black with wide hyaline gelatinous sheaths, $13.5-14.5 \times 22.0-23.5 \mu$
 Poronia punctata Fr.

- 1' Ectostroma brown, continuous and hard to distinguish from entostroma beneath; clavata discoid or urceolate with flat or concave surface; spores equilateral, narrow-ended, dark brown, with prominent gelatinous sheaths, $13.5-15.0 \times 23.5-25.5 \mu$

Poronia oedipus Mont. (Plate III: 6)

1. *Poronia punctata* Fries (Plate III: 3, 5, 7)

Ahmad S. Lloydia **9**, 140, (1946). Berkeley M. J. in Smith J. E.: English Flora **5** (2), 235, (1836); Outlines of British Fungology 385 (1860). Brefeld O. Untersuchungen aus dem Gesamtgebiete der Mykologie X, Ascomyceten **2**, 261, (1891). Cooke M. C. Handbook of British Fungi **II**, 791, (1871); Grevillea **8**, 72, (1879); Handbook of Australian Fungi 289, (1892). Currey F. Jour. Linn. Soc. Lond. **22**, 265, (1859). Dawson M. Ann. Bot. **14**, 245-260, (1900). Dennis R. W. G. British Cup Fungi 182, (1960). Ellis, J. B. & B. M. Everhart, Jour. Mycol. **3**, 112, (1887); N. Amer. Pyren. 659, (1892). Fabrè J. H. Ann. Sci. Nat. VI, **9**, 81, (1879). Ferdinandsen C. & D. Winge. Mykologisk Ekskursionsflora 399, (1943). Fries E. M. Systema Mycologicum 330, (1823); Summa Veg. Scand. 382, (1849). Greville R. K. Scottish Crypt. Flora **6**, 327, (1828). Gwynne-Vaughan H. C. I. & B. F. Barnes. Structure and Development of the Fungi 269, (1937). Hansen E. C. Vidensk. Meddel. fra den Naturh. Foren. **16**, 301, (1876). Hooker W. J. Flora Scotica **II**, 5, (1821). Jaczewski A. L. Bull. Soc. Myc. de Fr. **11**, 129, (1895). Karsten P. A. Mycologica fennica II. Pyrenomycetes 36, (1873). Kickx J. Flora crypt. de Flandres 309, (1867). Lambotte E. Flore mycol. belge 432, (1880). Lindau G. in Engler & Prantl: Die Natürlichen Pflanzenfamilien X, 489, (1897); Die Mikroskopischen Pilze in Krypt. für Anfänger **3** (1), 137, (1897). Lloyd C. G. Myc. Writ. **5**: Letter 66, 2-3, (1917); Myc. Writ. **6**, 937, (1920). Miller J. H. Mycologia **20**, 204, (1928); Bothalia **4**, 262, (1942). Nitschke T. Pyren. Germ. **1**, 19, (1867). Quélet L. Champ Jura & Vosges 489, (1875). Rabenhorst G. L. Deutsch. Kryptflor. **I**, 223, (1844). Rabenhorst L. Kryptflor Deutsch. **II**, 870, (1887). Rehm H. Berichte Naturh. Ver. Augsburg. **26**, 44, (1881); Ascomycetes Lojkani Hungaria 33, (1882). Schröter J. in Cohn: Kryptflora Schlesien 466, (1908). Starbäck K. Bih. Svenska Vet.-akad. Handl. **15**, 8, (1889). Traverso J. B. Flora Ital. Crypt **1**, 31, (1906).

sub *Poronia gleditschii* Willdenow

Greville R. K. Scottish Crypt Flora **6**, 327, (1828). Willdenow C. L. Florae berolinensis Prodromus 400, (1787).

sub *Peziza punctata* Linnaeus, C. Flora Suecica **II**, 458, (1755).

sub *Sphaeria poronia* Persoon.

Persoon C. H. Comment. Fung. Clav. 151, (1797); Syn. Meth. Fung. 15, (1801-1808).

Stromata gregarious, on dead stems or dung of various animals, unbranched or with up to 3 branches; clavate urceolate or aplanate, $0.7-5.0 \times 0.9-7.0 \times 0.5-2.5$ mm; stipes absent so that stroma is anchored at a central point only, ill-differentiated, or distinct, dull brown, smooth, $0.4-1.5 \times 0.0-9.0$ mm. Subiculum absent. Ectostroma convex, flat or concave, crustose, continuous except for protruding ostioles, pure white, corky. Entostroma corky to fleshy, without an external carbonaceous layer, and the outer part is usually ochraceous in colour, and the basal tissue pure white, solid. Perithecia always several per stroma, completely immersed, vertically oriented, adjacent, oval, $300-900 \times 400-900 \mu$; ostioles medium to prominent papillate. Asci cylindric or obclavate with narrow distal ends, with spores in monostichous or distichous formation, $140-190 \times 19-34 \mu$; stipes $10-30 \mu$. Spores oval to elliptic, equilateral, with broad ends, and prominent gelatinous sheaths, $12.0-16.5 \times 19.5-25.5 \mu$, ave. $12.8 \times 22.6 \mu$.

Material examined:

Martin 1757 ex Carroll 97; San Cristobal, Chiapas, Mexico, (1962). Martin 1796 ex Carroll 179; Jylland, Denmark, (1962). Miller; Bethel, Canyon City, Colo., U.S.A., (1913). (Mill.)

Imperfect stage:

Brefeld (1891), loc. cit. Cornu Ann. Sci. Nat. Bot. 6, 85—86, (1876). Dawson (1900), Lindau (1897), Traverso (1906), loc. cit.

Cultural characters (Plate VI:2):

Colonies velvety, with fine texture, uniform, pure white. Margin distinct, segmented; hyphae compact. Carbonization absent. Growth rate slow, 2·1 mm/day at 28°C optimum temperature.

Coremia unbranched, curved, aristate, white, without dark hyphae, sterile or fertile apically, 0·6—0·9 × 4·5—11 mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae = 2·0 μ . Secondary mycelium absent.

Conidiophores and conidia (Plate VII:2):

Conidiophores formed irregularly, rather short, 27—35 × 1·8 μ , unbranched or branched dichotomously once distally. Fertile branches narrow, lying freely, smooth, 9·6—16 × 1·2—1·8 μ . Conidia randomly developed or pleuracrogenous, on slender sterigmata, pyriform, white, 1·2—1·8 × 3·7—5·6 μ , ave. 1·5 × 4·8 μ .

Podosordaria Ellis & Holway E.W.D. Bot. Gaz. 24, 37, (1897).

Dennis R. W. G. Kew Bull. 1956, 442—443, (1956); Ibid 1957, 305—306, (1957). Seaver F. J. et al Mycologia 19, 43—50, (1927).

Podosordaria, like *Penzigia*, has never been critically defined, and the determinant characters are not easy to make out from the description. The “carnose texture and light brown colour” found in many species originally placed in *Kretzschmaria* and *Xylaria* refer, in the writer’s opinion, to the outer superficial uncarbonized entostromal layer visible in actual specimens of the type, *P. mexicana*. Since this structure is not typical for *Xylaria* or *Kretzschmaria*, inclusion of these species in *Podosordaria* is appropriate. It is probable that the limits of the genus are wider than previously supposed, and many species of *Xylaria* with ill-defined ectostroma are obviously close to *Podosordaria*, both in structure and host substrate preference. Dennis (1957, p. 306) transfers 3 species, *P. pedunculata* (Gray) Dennis, *P. tulasnei* (Nits.) Dennis, and *P. leporina* (E. & E.) Dennis from *Xylaria* and describes several further species of *Xylaria* which the present writer feels on the basis of his own examination belong in *Podosordaria*.

as well. Some of these, *X. nigripes* (Klotzsch) Cooke, *Xylaria axifera* Mont., *X. aristata* Mont., and allied species, have an entostroma that is superficially carbonous at maturity, and is thus intermediate between *P. mexicana* and *Xylaria* sensu strictu. The writer feels that the lack of ectostroma should take precedence, so that these species would still be grouped in *Podosordaria*. This is, however, an arbitrary decision, since the problem of overlapping characters is never easy to resolve (See Plate III:9, 11).

Podosordaria is certainly homologous with the later genus *Carnostroma* proposed by Lloyd (1919, p. 27). The single species *C. thyrsus* (Berk.) Lloyd has a dull outer surface but it lacks rigidity, and there is no suggestion of an ectostroma. The substrate is soil.

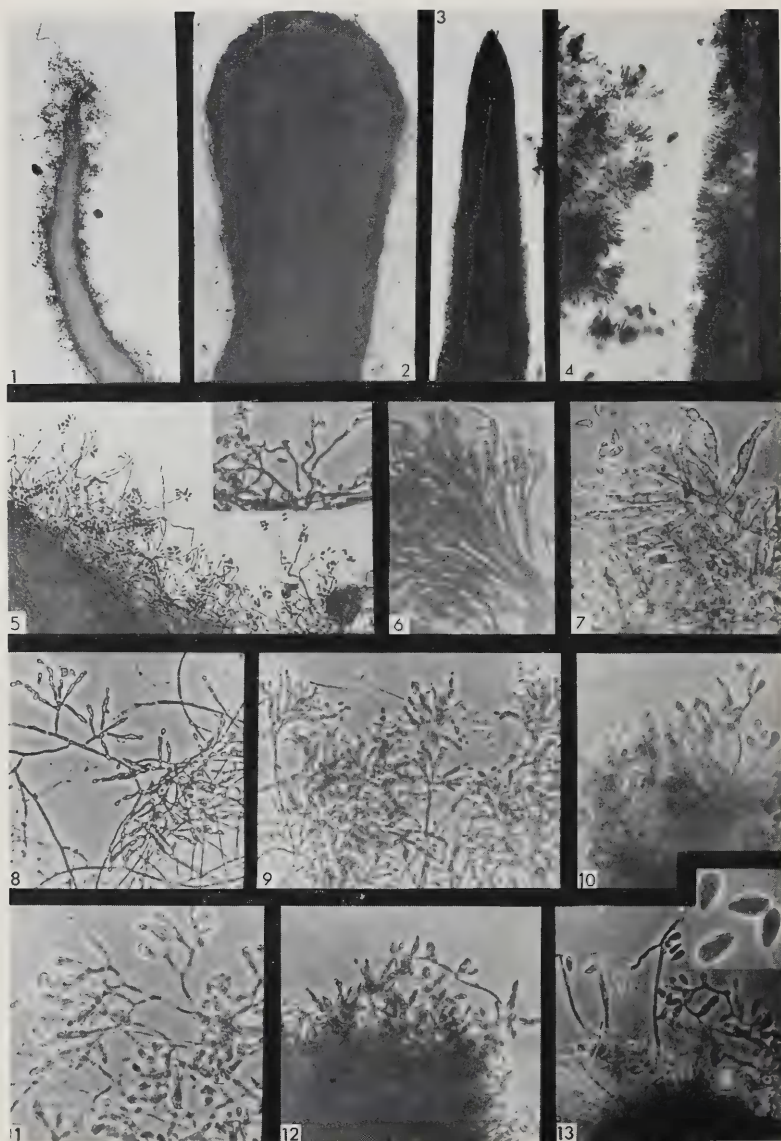
Podosordaria is probably also synonymous with *Xylariodiscus* Hennings (1899), but the writer has not had the opportunity to examine the type species *X. dorstenioides* Henn. Theissen (1908) has criticised the establishment of *Xylariodiscus* on the sole character of the aplano-pulvinate clava: "... so müssen wir für *Xylaria aristata* mit kugelig em kopfchen ebenfalls eine *Xylariosphaera* einführen, für *Xylaria thyrsus* mit Kegelformigen keule eine *Xylariocone*, usw. ..."

About the imperfect characters of *Podosordaria* little is known. Dixon (1965) has described a conidial form for *P. furcata* (sub *Xylosphaera furcata* (Fr) Dennis) unusual in the method of spore discharge, but in other respects consistent with species of *Xylaria*.

Key to the Species

- | | | |
|-------|--|----|
| 1 | Outer layer of the stroma white, yellow brown, ochraceous or grey and uncarbonized or with minimal carbonization..... | 2 |
| 1' | Outer layer of stroma black, hard or carbonaceous..... | 12 |
| 2 | Stroma with sterile apex..... | 9 |
| 2' | Stroma fertile to the apices..... | 2 |
| 3 | Stromata long stipitate, stipes over 15 mm long..... | 8 |
| 3' | Stromata short stipitate, stipes less than 15 mm long..... | 4 |
| 4 | On dead grass stems..... | 5 |
| 4' | On other substrate..... | 6 |
| 5 | Stromata small, unbranched, 1.7—2.8 mm diam., 0.8—1.0 mm high; surface cream coloured; spores gibbous, narrow ended, medium brown, 5.5 × 9.5 μ | |
| | <i>Podosordaria ustorum</i> (Pat) Martin | |
| | syn. <i>Poronia ustorum</i> Patouillard | |
| | <i>Xylaria ustorum</i> (Pat.) Dennis | |
| 5' | Stromata usually branched at the base of the stipe; clavulae pulvinate to hemispheric, 1.5—2.1 × 2.5—3 × 1.4—1.7 mm; spores 5—9 × 14—18 μ | |
| | <i>Podosordaria kurziana</i> (Currey) Martin | |
| | syn. <i>Xylaria kurziana</i> Currey | |
| 6 (4) | On wood: stromata branched at base of stipe; clavulae pulvinate, narrower than long, 3—4.5 × 5—6 × 2—3 mm; surface yellow ochre; spores equilateral, acute ended, dark brown, 5.5 × 15.0 μ | |
| | <i>Podosordaria truncata</i> (Pat.) Martin | |
| | syn. <i>Kretzschmaria truncata</i> Patouillard | |
| 6' | On wood: stromata unbranched, dark brown, small, with setose hyphae | |
| | <i>Podosordaria ciliata</i> (Pat.) Martin | |
| | syn. <i>Xylaria ciliata</i> Patouillard | |

- 6' On dung; stromata unbranched, clavata pulvinate, spores with prominent sheaths 7
7 Spores gibbous, narrow-ended, dark brown, $7.5 \times 15.0 \mu$; on rabbit dung
 Podosordaria leporina (E & E) Dennis (Plate III:8, 9)
 syn. *Poronia leporina* Ellis & Everhart
7' Spores equilateral, broad-ended, black, $15.5-16.0 \times 28.5-30.5 \mu$; on cow dung
 Podosordaria mexicana Ellis & Holway
 syn. *Xylaria chardoniana* (Toro.) Miller
 Penzigia chardoniana Toro.
8 (3) Surface of clava light brown, stipes 15—17 mm, perithecia evident; spores gibbous
 with acute ends, pale to medium brown, $5.0 \times 13.0 \mu$. Substrate: dead herbaceous
 stems
 Podosordaria rhizophila (Cke. & Mass.) Martin
 syn. *Xylaria rhizophila* Cooke & Massee
8' Surface of clava yellow ochre, stipes up to 85 mm; perithecia evident; spores
 gibbous, narrow-ended, dark brown, $4.0 \times 8.0 \mu$. Substrate: dead leaves
 Podosordaria pyramidata (Berk.) Martin
 syn. *Xylaria pyramidata* Berkeley
 ? *Xylariodiscus dorstenioides* Hennings
8'' Surface of clava cream-coloured; clavata aplanate, somewhat resupinate on axes,
 stipes up to 60 mm; perithecia evident; spores elliptic, broad-ended, dark brown,
 $13-14 \times 28 \mu$. Substrate: dung
 Podosordaria macrorhiza (Speg.) Martin (Plate III:4)
 syn. *Poronia macrorhiza* Spegazzini
8''' Surface of clava white, clavata flat pulvinate, stipes up to 100 mm, setose; peri-
 thecia not evident; spores elliptic, narrow-ended, medium brown, $9.0 \times 15.5 \mu$
 Podosordaria doumetii (Pat.) Martin
 syn. *Poronia doumetii* Patouillard
9 (2) Stromata small, filiform; clavata pulvinate, with perithecia scattered over stipe,
 single or grouped, evident in outline; spores gibbous, narrow-ended, black,
 $8.0 \times 15.0 \mu$, with prominent gelatinous sheaths; on dung
 Podosordaria hippotrichioides (Sow.) Martin
 syn. *Xylaria hippotrichioides* Sowerby
9' Stromata robust, growing from earth.....10
10 Clavata short pulvinate with conical apices, spores with prominent sheaths....11
10' Clavata short cylindric with apex produced; surface grey, perithecia vaguely
 evident; spores $12.0 \times 40.0 \mu$
 Podosordaria thyrsus (Berk.) Martin
 syn. *Carnostroma thyrsus* (Berk.) Lloyd
 Xylaria thyrsus Berkeley
11 Spores equilateral, broad-ended, dark brown, $10.5 \times 20.0 \mu$
 Podosordaria tulasnei (Nits.) Dennis
 syn. *Xylaria tulasnei* Nitschke
11' Spores equilateral, narrow-ended, black, $20.5 \times 39.0 \mu$
 Podosordaria pedunculata (Dicks.) Dennis
 syn. *Xylaria pedunculata* Gray
12 (1) Subiculum present as a rough tomentose covering beneath the stromata; apex
 sometimes produced with 1 or 2 depressed ostioles but not definitely sterile;
 stromata pulvinate, 1—2 peritheciate, occurring on wood; spores gibbous to
 navicular, with acute ends, medium brown, $7.0 \times 15.5 \mu$
 Podosordaria copelandii (Henn.) Martin
 syn. *Xylaria copelandii* Hennings
12' Subiculum present only as a fine setose covering on the stipes or absent; apices of
 stromata sterile.....15
12'' Subiculum absent; apices fertile or with definite perithecial rudiments.....13
13 Stromata small, with pulvinate clavata 1—2 mm in diameter and 1 mm high, on
 very short stipes; surface of stromata granulate but without definite ecostroma;
 spores equilateral, broad-ended, black, with prominent sheaths, $6.5 \times 12.0 \mu$. On
 wood
 Podosordaria plumosa Martin nov. sp.
13' Stromata elongate cylindric, robust, inhabiting termite nests; spore sheath not
 evident



- 14 Stromata simple, clavate or cylindric; spores gibbous, broad-ended, dark brown, $3.0 \times 4.0 \mu$
Podosordaria nigripes (Klotz.) Martin
 syn. *Xylaria nigripes* (Klotz.) Saccardo
- 14' Stromata branched to the first or second degree, narrow cylindric; spores gibbous, narrow-ended, dark brown, $2.5 \times 4.5 \mu$
Podosordaria furcata (Fr.) Martin
 syn. *Xylaria furcata* Fries
- 15 (12) Stipes long and twisted supporting clavate or pulvinate heads; clavata often characteristically bifurcate. Spores gibbous, narrow-ended, medium brown, with straight or sinuous germ slits $6.0 \times 11.0 \mu$. Habitat: soil
Podosordaria vaporaria (Berk. & Curr.) Martin
 syn. *Xylaria vaporaria* (Berkeley & Currey) 16
- 15' Stipes relatively short, substrate wood or leaves 16
- 16 Surface of stroma with gummous or resinous crusts, though no definite ectostroma; clava globose conic; spores gibbous, narrow-ended, dark brown, $8.0 \times 22.5 \mu$; on wood or dead leaves
Podosordaria axifera (Mont.) Martin
 syn. *Xylaria axifera* Montagne
- 16' Surface of stroma smooth with dry appearance; apparently restricted to dead leaves 16
- 17 Spores appendiculate, gibbous to navicular, narrow-ended, dark brown, $7.0-8.0 \times 12.0-13.5 \mu$
Podosordaria appendiculata (Ferd. & Wge.) Martin
 syn. *Xylaria appendiculata* Ferdinandsen & Winge 18
- 17' Spores without appendage 18
- 18 Stipes setose or loosely subiculate 19
- 18' Stipes glabrous 20
- 19 Spores gibbous to navicular, with acute ends, medium brown, $4.0-6.5 \times 10.0-11.0 \mu$
Podosordaria filiformis (A. & S.) Martin
 syn. *Xylaria filiformis* (A. & S.) Fries
- 19' Spores gibbous, with broad or narrow ends, dark brown, $6.0 \times 17.5 \mu$
Podosordaria heloidea (Penz. & Sacc.) Martin
 syn. *Xylaria heloidea* Penzig & Saccardo
- 20 (18) Spores $4 \times 6 \mu$
Podosordaria sicula (Pass. & Belt.) Martin
 syn. *Xylaria setocephala* Yeates
Xylaria sicula Passerini & Beltrano

PLATE VII. Conidiophores and Conidia

- 1—4. Coremia
1. *Podosordaria hippotrichioides* $\times (40)$
 2. *Poronia punctata* $\times (40)$
 3. *Xylaria gracillima* $\times (40)$
 4. *Xylaria gracillima* $\times (160)$
 : right, conidiophores in palisade formation on coremium; left, conidiophores teased out from coremium.
 5. *Podosordaria hippotrichioides*: Coremial surface with *Nodulisporium* conidiophores $\times (160)$ Inset: Detail of conidiophores $\times (210)$
 6. *Kretzschmaria heliscus* $\times (210)$
 7. *Xylaria anisopleura* $\times (210)$
 8. *Xylaria enteroleuca* $\times (210)$
 9. *Xylaria fioriana* $\times (210)$
 10. *Xylaria cornudamae* $\times (210)$
 11. *Xylaria longipes* $\times (210)$
 12. *Xylaria curta* $\times (210)$
 13. *Xylaria feejeensis* $\times (210)$ Inset: Detail of spores $\times (540)$

- 20' Spores navicular to crescentic, with narrow ends, dark brown, $6.5 \times 11.0 \mu$
Podosordaria aristata (Mont.) Martin
 syn. *Xylaria aristata* Montagne
- 20'' Spores navicular, with narrow ends, medium brown, $8 \times 20-28 \mu$
Podosordaria schreuderiana (van der Byl) Martin
 syn. *Xylaria schreuderiana* van der Byl

Analysis of species:

1. *Podosordaria nigripes* (Klotzsch) Martin

sub *Xylaria nigripes* (Klotzsch) Cooke

Cooke M. C. *Grevillea* **11**, 84-85, (1883). Lloyd C. G. *Myc. Writ.* **6**, 893, (1919); *Ibid* **6**, 973, (1920); *Ibid* **6**, 1087, (1921); *Ibid* **7**, 1251, (1924). Miller J. H. *Bothalia* **4**, 269, (1942). Petch T. *Ann. Roy. Bot. Gard. Perad.* **3**, 237-243, 246-248, (1906); *Ann. Mycol.* **5**, 401-403, (1907); *Ann. Roy. Bot. Gard. Perad.* **5**, 328-333, (1913); *Ibid* **5**, 306-307, (1913). Raut A. *Tidsch. Teysmannia Afl.* **4** & **5**, 171-173, (1921). Rehm H. *Hedwigia* **28**, 299, (1889). Saccardo P. A. *Syll. Fung.* **IX**, 527, (1891). Sydow H. & P., & E. J. Butler *Ann. Mycol.* **9**, 419, (1911).

sub *Xylaria flagelliformis* Curr. & *X. mutabilis* Curr. Currey F. *Trans. Linn. Soc. Lond.* **II**, **1**, 129, (1876).

sub *Xylaria gardneri* Berkeley

Berkeley M. J. & C. E. Broome *J. Linn. Soc. Lond.* **14**, 118, (1875).

Stromata gregarious, unbranched; clavata cylindric, $3.0-3.5 \times 2.0-4.0 \times 10-35$ mm, with fertile apices; stipes distinct, smooth, $1.5-2.0 \times 90-100$ mm. Subiculum absent. Ectostroma absent at maturity. Entostroma sandy brown to black, verruculose, crinkled, externally carbonaceous, internally fleshy, solid, dull yellow to dull brown or black. Perithecia several per stroma, vaguely evident, adjacent, oval, $250-300 \times 750-800 \mu$; ostioles medium papillate to prominent. Asci quoted by Miller as cylindric, $40-46 \times 4-5 \mu$; stipes 14μ . Spores broad oval, gibbous, dark brown, $2.5-3.0 \times 3.5-4.5 \mu$, ave. $3.1 \times 4.1 \mu$.

Material examined:

Van Hohnel in Rehm's *Ascomyceten* 1810; on termite nests, Buitenzorg, Java, (1907-1908), (NYBG). Martin 1613 (culture only) ex Wright 2081; Misiones, Argentina, (1962).

Imperfect stage:

sub *Sclerotium stiptitatum*

Berkeley M. J. *Trans. Linn. Soc. Lond.* **23**, 91-92, (1862). Petch T. *Ann. Roy. Bot. Gard. Perad.* **5**, 306-307, (1913).

sub *Xylaria nigripes*

Petch T. (1907), (1913), loc. cit.

Colonies velvet-felty, with coarse texture, uniform, pure white. Margin not distinct, entire; hyphae compact. Carbonization slight. Growth slow, 1.9 mm/day at 25°C. No conidia were observed. Petch describes a coremial structure typical for *Xylaria*, with narrow conidia, $2 \times 4-6 \mu$.

2. *Podosordaria plumosa* Martin nov. sp. (Plate III:10, Fig. 1:6).

Stromata minoris, nigra; clavata 3-4 mm lata, stipes 0.3-2 mm longis; sporae nigrae, medius $6.4 \times 12.2 \mu$. In ligno.

Stromata small, superficial on decorticated wood, clearly divided into a flat or convex fertile portion 3.0—4.0 mm in horizontal diameter and a narrow terete glabrous stipe 0.5—0.8 × 0.3—2.0 mm long. Ectostroma not visibly retained at maturity, crustose, continuous, dull brown. Entostroma with the usual differentiation into a hard carbonous exterior and fleshy white basal tissue, the latter persistent in contrast to the previous two species. Perithecia 4—10 per stroma, vaguely evident in outline, globose, 500—650 × 600—700 μ ; ostioles indistinct papillate. Asci clavate or cylindric, long stipitate, 115—160 × 10—12 μ ; stipes 50—85 μ . Spores oval, equilateral with rounded ends, with prominent gelatinous sheaths, black, 5.0—7.5 × 10.5—13.5 μ , ave. 6.4 × 12.2 μ .

South African hosts: *Lycium campanulatum*, old and very decayed wood.

Material examined:

Martin 410; Fish River Valley, nr Grahamstown, E. Cape, South Africa, (1958).

Cultural characters (Plate IV:9; Plate V:12,15):

Colonies velvety, dense and closely appressed, zonate with 3 or more zones produced by 14 days, with a rather coarse surface, dull white opaque, tinted pink. Margin distinct, 1—2 mm wide, canescent at first becoming plumose, entire or irregularly segmented, compact. No stain or carbonization. Growth rate slow, 1.9 mm/day at 28°C optimum temperature. Growth on Leonian's broadly similar, on maize and Czapek considerably reduced, submersed, uniform, white subhyaline and gelatinous. When grown on wood blocks the fungus develops long plumose tassels of parallel hyphae up to 15 mm long and 2 mm wide. No coremia have been observed.

Microscopic characters (Fig. II:11):

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae = 2.6 μ . Secondary mycelium loose, 1.8—5.4 μ in diameter.

Conidiophores and conidia:

Sterile, both in the field and in culture.

3. *Podosordaria hippotrichioides* (Sow.) Martin nov. comb. (Plate III: 11)

sub *Xylaria hippotrichioides* Sowerby

Berkeley, M. J. Mag. Zool. & Bot. 3, 205, (1838). Jaczewski A. L. Bull. Soc. Myc. de France 11, 131, (1895). Petch T. Naturalist 1939, 159, (1939).

Stromata gregarious, growing on dung, unbranched, consisting of a relatively long sinuous stipe, dull brown and smooth, 0.2—0.3 × 5.0—7.0 mm, bearing perithecia in an ill-differentiated distal cylindric clava, 0.6—0.7 × 0.6—0.9 × 0.7—1.5 mm. Subiculum absent. Ectostroma not clearly distinct; entostroma externally smooth, convex, dull brown and corky, internally fleshy, dull white.

Perithecia 1—7 per stroma, evident to base, laterally oriented, oval, $300—400 \times 400 \times 400—500\mu$; ostioles medium papillate. Asci cylindric, $95—105 \times 8—9\mu$; stipes $16—24\mu$. Ascal plugs not apparently present. Spores oval, gibbous, with narrow ends and prominent gelatinous sheaths, black, $7.0—9.0 \times 13.0—16.5\mu$, ave. $8.0 \times 15.0\mu$.

Material examined:

Martin 1812 ex Cain, Mt. Toby, Mass., U.S.A., (1963).

Cultural characters (Plate VI:3):

Colonies felty, with coarse texture, strongly zonate, pure white. Margin not distinct; hyphae compact. Carbonization absent. Growth rate slow, 0.9 mm/day at 15°C temperature optimum.

Coremia unbranched, curved, aristate, without dark mycelium, white, fertile over apices and sides, $0.2—0.3 \times 2.0—7.0$ mm.

Microscopic characters:

Primary mycelium undiagnostic; maximum diameter of the marginal hyphae $=1.8\mu$. Secondary mycelium absent.

Conidiophores and conidia (Plate VII:1, 5):

Conidiophores produced directly off the colonies as well as off the coremia, developed irregularly, $220—375 \times 1.5\mu$, branched dichotomously or ternately to the first degree distally or over the entire length of the axes. Fertile branches lying freely, narrow, regular, partly serrate or typically geniculate (*Nodulisporium*), $15—45 \times 1.8—2.4\mu$. Conidia acrogenous or pleuracrogenous, off stout sterigmata, somewhat thick-walled, narrow clavate, white en masse, $1.8—3.1 \times 4.3—7.5\mu$, ave. $2.5 \times 5.3\mu$.

4. *Podosordaria sicula* (Pass. & Belt.) Martin nov. comb.

sub *Xylaria sicula* Passerini & Beltrani

Lloyd C. G. Myc. Writ. 7, 1253, 1309, (1924); Passerini G. & Beltrani I. Hedwigia 22, 120, (1883). Saccardo P. Sylloge Fungorum IX, 534, (1891). Traverso J. B. Flora Ital. Crypt. 1, 26, (1906).

Stromata gregarious, on leaves, very minute, unbranched; clavata globose, weakly differentiated, $800—1000\mu$ in diameter with up to 4 perithecia in evident outline; stipes $300 \times 3000\mu$, smooth, often continued above the stroma for another 6 mm to end in a long black apex. Subiculum absent but stipe is often sparsely setose. Ectostroma absent. Entostroma convex, verrucose, dull black, externally somewhat carbonaceous but not rigid, internally fleshy and pure white, solid. Perithecia oval, adjacent, $300—400 \times 500—600\mu$; ostioles medium papillate. Asci and spores not seen since material examined was immature. Spores quoted as $4 \times 6\mu$ in literature.

	Perithecia vertically oriented only; sterile apices of stromata excentric when present	Ecotostroma continuous	Species partly intermediate with sessile or subsessile applanate forms Species always distinctly stipitate, without hypoxylloid forms				K. deusta
			Species partly intermediate with sessile or subsessile pulvinate forms, or with stipules, or with perithecia evident to base (cf. section <i>Entoleuca</i>)	Dark mycelium scanty or absent from coremia, or developed in culture; coremia often clavate or spatulate	Conidiophores irregularly arranged or in palisade formation	ecotostroma tomentose	K. heliscus { X. foriana X. lanthovelutina
Stroma with black or carbonaceous entostromal layer		Ecotostroma divided in plaques or strips					X. curta X. polymorpha X. mali
Stroma with black or carbonaceous entostroma	Perithecia vertically oriented, often well; sterile apices of stromata centric when present					spiral germ slits on ascospores	{ X. anisopleura X. cornudamae
			Species always distinctly stipitate, without hypoxylloid forms	Dark mycelium prominent on coremia; coremia usually aristate only	Conidiophores in palisade formation only	spiral germ slits on ascospores	{ X. fejeensis X. fejeana X. leprosa X. longipes
							X. apiculata X. arbuscula X. luteostroma X. hypoxylon X. digitata X. multiplex X. castorea
							X. cubensis X. myosurus Poronia punctata
Stroma without black or carbonaceous entostromal layer				Dark mycelium scanty or absent from coremia, or developed in culture; coremia often clavate or spatulate	Conidiophores irregularly arranged		Podosordaria hippotrichioides
Stroma with black or carbonaceous entostromal layer				Dark mycelium prominent on aristate coremia			Podosordaria nigripes Podosordaria plumosa Podosordaria sicula
Stroma without well-defined ecotostroma							

Material examined:

Maire in *Mycotheca boreali africana* 100, in Miller 100; on *Olea europaea* leaves, L'Alma, country not stated, (1912), (NYBG). Martin 675; culture only, ex CBS, Baarn, Netherlands, (1961).

Cultural characters (See Martin (1967) Plate V:2):

Colonies felty, with fine texture, uniform, pure white. Margin distinct, entire; hyphae compact. Carbonization extensive; growth rate slow, 1.1 mm/day at 25°C.

Coremia ropy, unbranched or with up to 5 branches, straight aristate or spatulate, mostly carbonized, white initially but later almost uniformly black except for occasional white apices, $0.2-0.8 \times 1.5-25$ mm, sterile. The structure of the coremium is similar to the *Graphium*-type noted for many species formerly belonging to *Rosellinia* that the writer (1967) placed in *Hypoxylon* section Entoleuca (*H. aquilum*, *H. necatrix* etc.) but the size and length of the coremia agrees with those of other coremia discussed here.

Microscopic characters:

Primary mycelium undiagnostic; maximum width of the marginal hyphae = 1.5μ . Secondary mycelium uniform, close reticulate; hyphae $2.5-3.1\mu$ in diameter.

Conclusion

This study of twenty-eight members of the fleshy genera of the Xylariaceae shows that as a whole they stand well apart from the other groups in cultural as well as stromal characters. Yet the differences between the fleshy genera themselves are much less definable than amongst the corresponding genera with woody or corky structure, as the accompanying table shows (see Table I). One basic cultural type unites these species with an apparently wide range of stromal divergence, possibly indicating a relatively high degree of interrelationship.

The aim of the whole of this work was to present an analytical review of the twenty-one presently recognized genera of the Xylariaceae, in which the characters originally used in classification were evaluated and compared with several of those newly selected or little studied. In this way it has been possible to reduce several taxa by assigning the species to older established genera and by giving clearer definition to generic concepts. Now only twelve genera, in which there is a broad correlation between stromal and conidiophore types, appear to be valid.

More work of an objective nature is required before these genera can be accepted as natural units. Practically nothing is known of the physiological differences which give rise to a specific type of stroma or colony in culture. Until these are known, a natural classification of the Xylariaceae will still remain an intransigent and fascinating problem.

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